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To the Railway Officer

IT ISN'T necessary to inform you that we are passing through one of the most trying periods of our railway history. The exorbitant demands of employes whose organizations are taking every advantage of certain political trends, added to the dilatory tactics and confiscatory rulings of law makers and commissions, topped by a financial condition which has caused concern among those better favored, has forced you to cut expenses where such cuts are not economical. You are unable to take advantage of opportunities to put into effect plans for improvements in methods and equipment which would be money savers from the start, simply because they call for an initial outlay.

Realizing that these conditions *must* change, the more reliable, solidly grounded supply manufacturers are going ahead in the development of new devices and methods and in the improvement of the old. They are not bothering you by insisting that you buy large amounts of equipment and supplies, for they know that you are helpless, but they do need your moral support if they are to go ahead in the improvement of the art. Most of you are lending that support and deserve credit for that assistance.

Sometime you will have to buy, and, in large quantities. Had conditions continued prosperous without cessation, improvement in all devices and equipment would have kept pace. Upon the return of prosperity none of you wish to begin where you left off and you will not have to begin there with most of the manufacturers whom you have found to be the most progressive in the past, because they have, undaunted by conditions and discouragement, increased the efficiency of their various details of equipment expecting your moral support now and a more tangible species of support later. It is therefore your duty, owing to the art of American railroading, that you see each supply representative who has legitimate reason for his call and that you give his proposition the consideration it deserves and the study it requires.

To the Railway Supply Manufacturer.

In times of prosperity your representatives have waited outside the offices of railway officers for hours and days, hoping for the opportunity to present arguments for the sale and standard adoption of devices and methods which you have carefully worked out at considerable expense of time and labor. You have sometimes found it impossible to obtain opportunity to demonstrate superiority which you knew you possessed because the officer you must reach was too busy to give it the proper attention, and because he did not dare initiate a movement which might handicap him in keeping every piece of equipment in service in supplying the demands of traffic.

A return to conditions of ultra-prosperity is inevitable, the longer the return is postponed the more marked will be the improvement. We are sincere in our remarks addressed to the railway officers, as above, and we believe that you are not laying down in discouragement because actual orders are small and infrequent, or because you infer that your efforts in the development of improvement are not appreciated. We believe it is up to you to bend every effort at this time to inform every interested railway officer in the country of your activity in new economy-producing and labor-saving devices. We believe that you have better opportunity at the present time for securing the attention and consideration of those who will later, taking advantage of what you now show them, base their recommendations for fu-

ture purchase upon what you now teach them, than you will ever have again.

The conclusion is obvious: If you have an improvement which does not require additional outlay on the part of the railway, visit the railway officer with the hope of securing immediate orders; but if your proposition does require initial outlay, visit him with the idea of securing his approval and therefore his guarantee of recommendation at the proper time.

The Roadmaster's Convention

THE entire status of the Roadmasters' and Maintenance of Way Association, which is spoken of on another page in this issue, is now on a firm basis as regards the financial standing, the numerical and representative standing of its membership and the position that the work of the committees and the association as a whole is assuming. The scope of the reports and the manner in which they were handled by the committees is deserving of high commendation and ought to be a matter of gratification to the association. The proceedings of the last few years of the association have constantly emphasized the necessity of changing the methods of track construction and maintenance on account of the ever increasing weight of equipment and the accelerating density of traffic. The committees are on the right road to bring about reforms and progress in track work in a permanent way, which is needed more and more, as the weight and resisting force of the track has not increased in the same ratio as the weight of equipment within the past decade. Added to this condition that has to be met by the roadmaster is the situation regarding labor for the track work. Formerly he only had to consider the promotion of the skilled track labor, but now it is difficult to get labor of any kind and the type most generally procured is of foreign birth who can neither read, write or speak our language and are not at all familiar with the work or methods of American railways. The roadmaster is beginning to recognize the feasibility of the application of machines to do a large part of the track work that a few years ago was never even contemplated. He is beginning to adapt himself to these changed conditions even as men in other lines of work have been constantly doing for years past. The application of power loading machines, power ballast dressing machines, ditching machines, and now power tamping machines are past the development stage. The roadmaster of the near future on the larger systems that can afford the first cost of these machines will find that the major portion of the heavy labor is well taken care of by machinery and will therefore have less concern than now of the difficulties of procuring labor. But he will be still confronted with the problem of securing proper foremen. With the lessening of the labor payroll by the introduction of machinery the railway companies will probably be willing to pay a salary for the foremen's positions that will prove sufficient to attract good permanent American foremen. Thus the roadmaster's burden will be greatly relieved and he will be able to devote more attention to the procuring of and development of student foremen. We were impressed by the discussions and committee reports adapting the track department organization to changed conditions of wheel load and tonnage, and particularly to the financial status of the railways. This is as it should be, for the roadway is the very foundation of the railway and, as one of the speakers remarked, railway men and trackmen are "manufacturers of transportation," and the work should be carried on along economical manufacturing lines. There seemed to be a tendency among some of the members in the discussion of committee reports to be over-conservative about making recommendations of standards of work and material. Again they were afraid of conflicting with the Engineering Association standards. This hesitancy should not exist. Recommendations mean progress, and it is a very easy matter for the Roadmaster's committee chairmen to confer with the corresponding committee chairmen of the Engineering Association, who unquestionably will be glad to coöperate. There was a discussion early in the session as to the advisability of sending out printed copies of the committee reports that were to be presented at the meeting, the idea being that if this was done the attendance would be diminished. The experience of all the other railroad associations does not bear this out, as they send out advance copies of reports. The fundamentals that comprise a committee report are, assimilation, digestion and discussion. The sending out of advance copies would take care of the first named and avoid a great deal of useless discussion in the meeting, which would save valuable time.

One of the interesting points brought out during the discussions was the urgent need of impressing upon the managements the necessity of changing the fiscal year from June 30 to January 1, or at least February 1. It is inexplicable why for years the managements have allowed the best part of the year for tie and rail renewals to pass on account of a favorable showing of stock material on hand to be made at the end of the fiscal year. If the proper comparative figures were compiled showing the annual loss to the railways on account of this method and presented to the managements they would be able, we are sure, of convincing the executives and the banking interests of the wisdom and economy of moving the fiscal year ahead of the spring months. These men through their organization are working so effectively and conscientiously that no official of any maintenance of way department, whatever his title, can well afford deferring his application for membership in the association.

Heavy Transportation Movement

WHEN the present cataclysm overcame Europe there were a great many railway engineers, particularly in Europe and England, who were sceptical as to the ability of the German railways, government owned and controlled, to handle the troops and supplies of the army. They contended that the German permanent way and equipment were not heavy enough to handle the tonnage of supplies and the number of troops necessary in a continuous concentrated movement. Comparisons were made with Canadian and American railways as being much better built and equipped for handling movements of this type.

The reports received of the train movements in Germany that have taken place within the past six weeks seem to refute these arguments. For example six hundred carloads of food must leave Coblentz, Cologne, Aix-la-Chapelle, or whatever for the time being is the commissary depot, daily for the 500,000 men supposed to be operating in Belgium, Luxemburg and possibly Holland. The chances are that 900 cars are being used for the conveyance of one day's "iron" ration. For ammunition there must be a minimum of 300 cars. For forage and other quartermaster stores there must be a minimum of at least 1,000 cars, although the probabilities are that a much larger number are being used.

The Belgian railways probably are being used to get the supplies to the advanced bases or depots, which are as near the rear of the army as is consistent with safety.

Fifty-five thousand wagons, drawn by 660,000 animals, or their

equivalent in motor vehicles, are needed to get supplies to a force such as is supposed to be operating in Belgium.

During the first two weeks of September the German government moved five army corps, 200,000 men, from the French frontier to the Russian frontier in forty-eight hours. This distance is between 400 and 500 miles, and the number of cars necessary to do this, from the American standpoint, would be 2,000, or 200 trains of 10 cars each. Inasmuch as the German car has about 40% the capacity of the American, it can be seen how much equipment is required. Up to September 15 the German railways were still running express trains with sleepers and dining cars for the convenience of regular intrastate patrons, in addition to the troop trains. Our information has been received from one of our regular foreign correspondents. If the origin of these reports is authentic this is the biggest movement of this nature ever accomplished by a railway in such a short space of time.

The Railway Situation

The decision of the Interstate Commerce Commission in the rate case was evidently made in a hurry, brought on by strong pressure on account of the European situation, notwithstanding that it took them 14 months to deliberate on the matter. The recent meeting of the railway executives with the President will probably bring forth good results as far as the re-establishment of the railway credit is concerned. But it is problematical if this meeting should cause a reopening and a reversal of the rate decision by the Interstate Commerce Commission, if it will result in any particular good at this late day. As a prominent traffic official has said "if the increase of 5 per cent had been granted at, or near, the time the railways asked for it there would probably have not been serious objection to it by the average big shipper, on account of the gross of his business. But now there is likelihood of objection by these same shippers on account of their gross receipts having been most seriously curtailed by the general business depression." This is another example of the dilatory tactics of the commission and another argument for having efficiency obtained by appointing trained railway men on the commission, as we have said several times before, and as the daily papers have again recently mentioned. At the meeting with the President the memorandum of Frank Trumbull, chairman of the executive board of the Chesapeake & Ohio Railroad Company, spokesman for the railway operators, is declared by President Wilson to be a "lucid statement of plain truths."

The President has recognized the force of these statements. The whole country should be quick to follow him in recognizing them, and in the words of the President, "the interest of the producer, the shipper, the merchant, the investor, the financier and the whole public in the proper maintenance and complete efficiency of the railways is manifest. They are indispensable to our whole economic life."

Some of the railways have decided to advance their passenger rates to 2½ cents a mile on interstate business. This will mean confliction in many instances with the rulings of state commissions on intrastate business. It is to be hoped that this will be brought to an issue, for it will settle the question of the jurisdiction of state commissions over interstate railways in contradistinction to the rulings of the Interstate Commerce Commission.

The Rosston, Grand Rapids & Protection has a survey finished on ten miles. L. A. Walton, Alva, Okla., is president.

Twenty Years Ago This Month

Howard F. Parke, formerly division superintendent of the Missouri Pacific at Sedalia, Mo., has been appointed superintendent of transportation for the Union Pacific, Denver & Gulf Road, with headquarters in Denver.

Howard Carson, chief engineer of the Metropolitan Sewer Commission, of Boston, Mass., has been appointed chief engineer of the Elevated Railway and Subway Commission of that city.

John E. Searles, of Baltimore, Md., has been elected president of the Baltimore, Chesapeake & Atlantic, a new company organized to develop the railway and steamship systems of the Maryland peninsula.

George C. Smith, formerly assistant general manager of the Missouri Pacific, has been appointed president and general manager of the Western Ry. of Alabama.

W. B. Causey has been appointed engineer maintenance of way of the Atlantic & Danville R. R.

C. E. Schaff has been appointed assistant general manager of the Cleveland, Cincinnati, Chicago & St. Louis.

William L. Bull, of New York City, has been elected president of the Minneapolis & St. Paul.

R. E. Briggs, formerly chief engineer of the Denver & Rio Grande, and recently in charge of reconnoissance for the Mexican, Cuernavaca & Pacific, now building in Mexico, has assumed temporary charge of the engineering department of the company. John E. Conly, chief engineer of the company, has resigned, as recently reported. The office of chief engineer has been abolished.

William H. Russell, chief engineer of the Boston & Albany, has been made consulting engineer and his former office will be filled by Walter H. Shepard, of Boston, who has been assistant chief engineer for several years. Mr. Russell is now about 76 years old, and he has been chief engineer of the Boston & Albany since 1858. He worked with the surveyors in the construction of the road as far back as 1838, but was a farmer from 1842 to 1845, and then worked as an engineer in the construction of the New York & New Haven, the New London, Northern and other roads before returning to the Western. The local papers say that besides being promoted he receives an increase of salary.

George B. Harper, general superintendent of the Kentucky Midland, is now operating that property as receiver.

J. C. Tierney has resigned as general roadmaster of the Peoria, Decatur & Eastern and the position has been abolished.

F. L. Gastinghouse, who was formerly chief engineer of the Pittsburgh Bridge Company, has accepted the position of chief engineer of the structural department of Jones & Laughlin's plant.

Victor Wierman, assistant engineer of the Pittsburgh division of the Pennsylvania Railroad, has been appointed superintendent of the Bedford division of that road to fill the vacancy caused by the transfer of its former superintendent, Frank Robb, to the Cambria and Clearfield division. Mr. Wierman has been assistant engineer on the Pittsburgh division since 1886. He has been connected with the Pennsylvania since entering railroad work. He was first on the New York division and became supervisor there, being transferred afterwards to the West Pennsylvania division as assistant engineer until 1886.

Charles Clegg has resigned as general manager and chief engineer of the Interoceanic Railway of Mexico.

J. H. Cain on October 1 resigned as chief engineer of the Mexican Central and the office has been abolished.

G. A. Weed has resigned as superintendent of bridges and buildings of the Oregon Railway & Navigation Company.

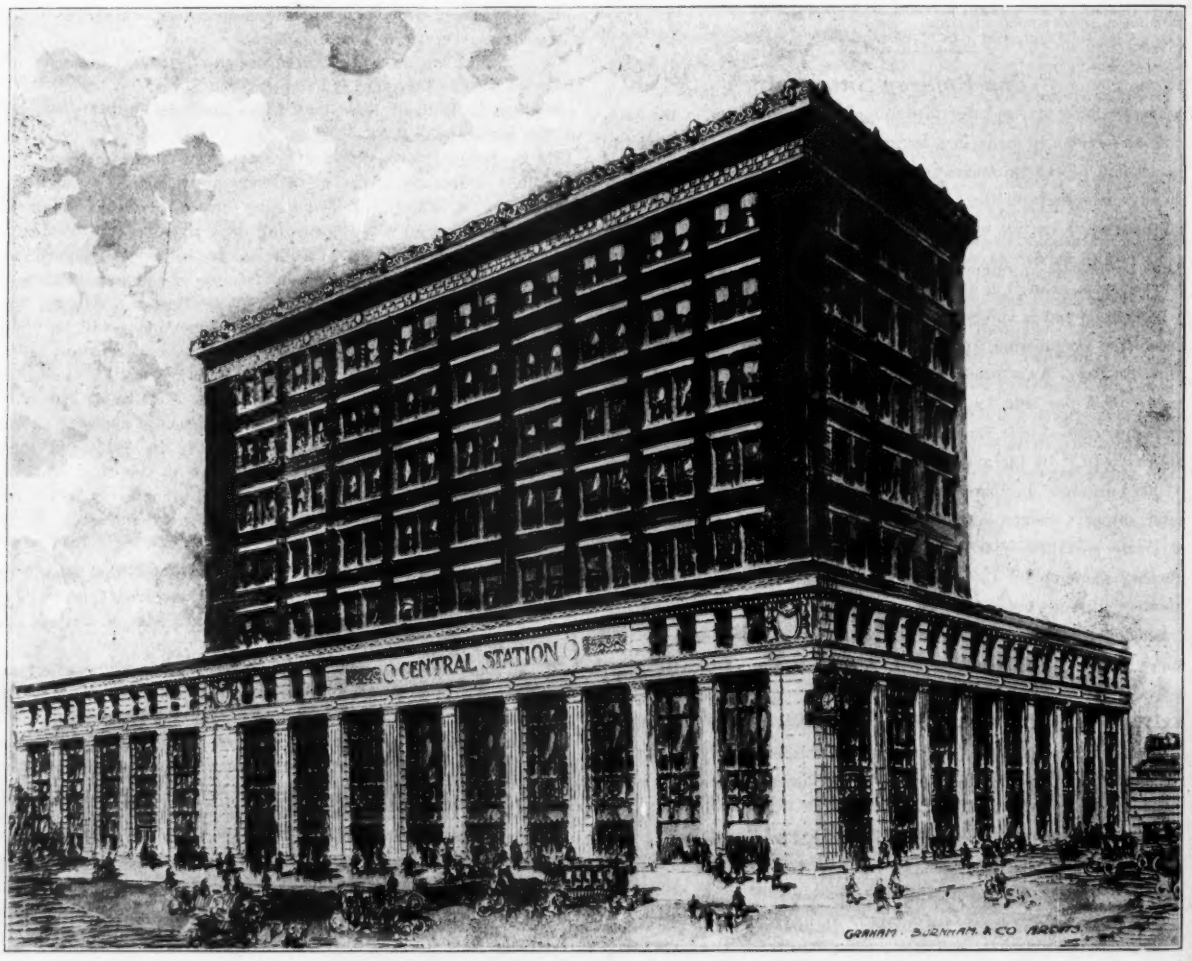
B. A. Cunningham has been appointed division engineer of the Lehigh Valley between Manchester and Wilkesbarre, Pa.

W. B. Poland has been appointed assistant chief engineer of the Cleveland, Cincinnati, Chicago & St. Louis at Cincinnati, Ohio.

Edward A. Haskell has been appointed roadmaster of the second division of the Boston & Albany, with headquarters at West Brookfield, Mass.

The Illinois Central New Central Station and Track Elevation, Memphis, Tenn.

The new Central Station that has been erected by the Illinois Central Railroad Co., at the corner of Main street and Calhoun avenue, Memphis, Tenn., is a notable improvement and in many ways of the greatest interest to the engineering profession. The station went into service Sunday, October 1st, but the formal opening will not take place until October 21st. The building will represent a station development of the most complete type, including in the same building the most ample facilities for the convenience of passengers and at the same time furnishing space for the headquarters offices of the railroads directly interested. The building proper, exclusive of tracks, train sheds, viaducts and approaches occupies a space 250 feet by 150 feet and rises to a height of eight stories, the top of the cresting which surmounts the main building being 130 feet above the sidewalk.



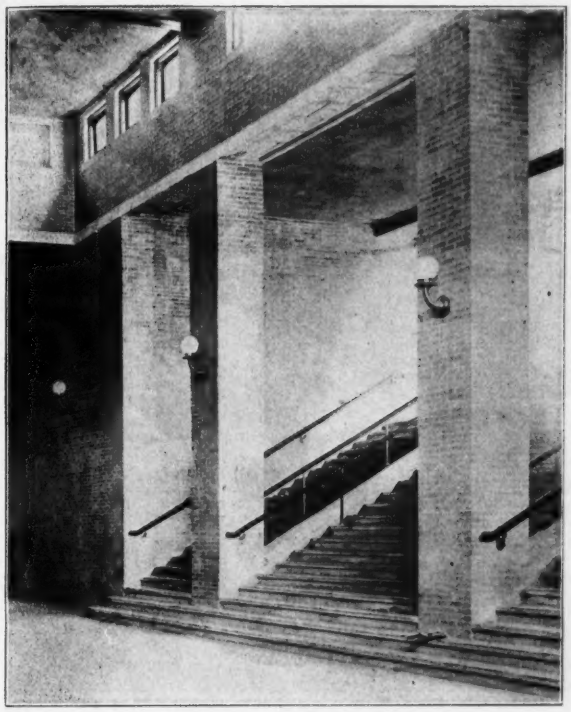
General View of Station, Memphis, Tenn., Ill. Central.

The fortunate circumstance that the passenger tracks penetrate the city at the upper level, has been profited by to bring about a station plan giving the most ample areas to the different rooms used by the public and at the same time achieving a compact grouping of the public facilities, which will be of the utmost convenience to the patrons of the railways. The principal entrances on Main street consist of five large doorways, no steps being used, so that one may pass from the sidewalk to the main entrance ticket and baggage lobby without let or hindrance.

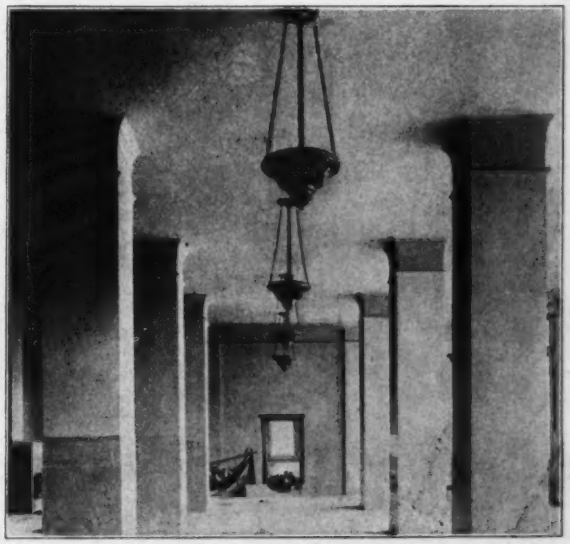
The ticket office with a lineal frontage of 80 feet is distant only 30 feet, from the baggage checking counter 50 feet long, the entire arrangement being upon the most ample scale and at the same time conveniently disposed for the immediate transaction of business by passengers without loss of a moment's time. Immediately off the ticket lobby is a lunch room lighted by large windows, fronting Calhoun avenue; and next the lunch room is the drug store, which has been found by experience to be an important adjunct of a large railway station. The facilities for colored people have been carried out in a similar manner.

After purchasing his ticket and checking his baggage, the passenger proceeds by means of a grand staircase about 20 feet wide to the second floor level, where he finds himself in a great waiting room 75 feet by 100 feet and nearly 40 feet high. In the design of this room a great deal of thought and study has been devoted to the problems of lighting and ventilating, in order to make it an agreeable place during the warm summer months. With this end in view, the central part of the room, about 45 feet by 80 feet in dimensions, is raised higher than the rest of the hall in order to provide a clerestory window completely encircling the room, shaded from the direct rays of the sun and permitting the freest movement of air. It is believed that this will be one of the most agreeable waiting rooms ever constructed.

Immediately adjoining this waiting room and reached by a few steps by a broad stairway, is the general waiting room, the large



Stairway to Train Concourse in Station Building.



General Waiting Room.

women's rest room and usual toilet facilities. Upon the other side is the men's smoking room, barber shop and toilet. Suitable booths and shops for newsstand, telegraph office and other facilities are provided in immediate contact with the waiting room.

The facilities for the colored people have been worked out in a similar though less pretentious scale. Their waiting room with its toilet room dependencies is placed entirely to one side and so disposed that the colored passengers pass directly to the concourse by means of an independent lobby.

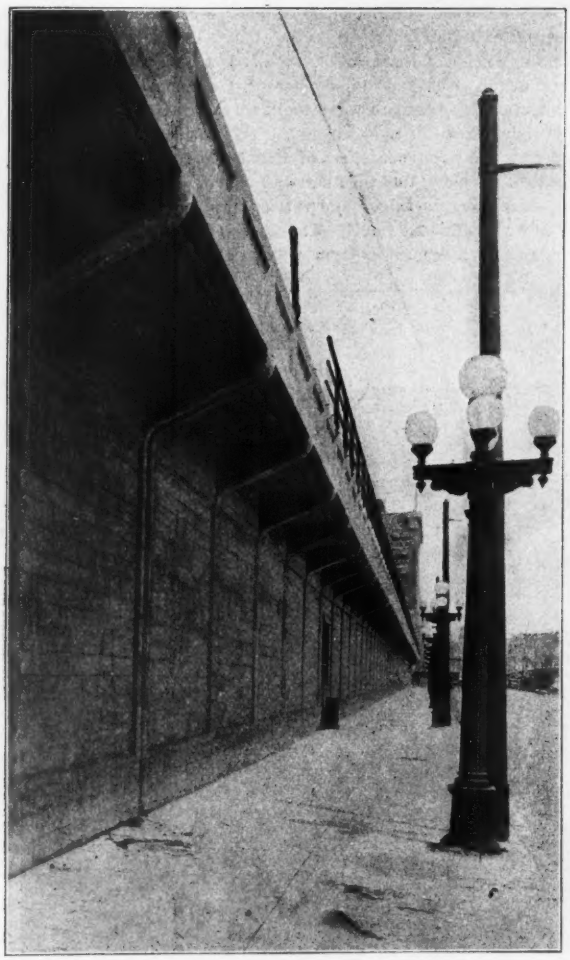
The concourse, 35 feet by 125 feet, is provided with two means of direct exit to the street, one to Main street, the other to the covered baggage and carriage approach, opening out directly on Calhoun avenue. The facilities for taking care of passengers arriving in wheeled vehicles are most ample, so that vehicles requiring to wait at the station may be properly protected from the weather.

Immediately off the concourse is a large emigrants' room with independent toilet facilities.

In the design of the exterior the aim has been to make a building of the most monumental character. The Roman Doric order of architecture has been used, and the main motif consists of a colonnade rising from the sidewalk to the first cornice line, a height of 45 feet. The colonnade effect of fluted pilasters, is framed in by broad corner piers, tied together with a high frieze which occupies one whole story in height and carries upon a large central panel the title "Central Station." The upper office stories are crowned by a very rich cornice and parapet design, in sympathy with the

View of Station Tracks from Office Building.

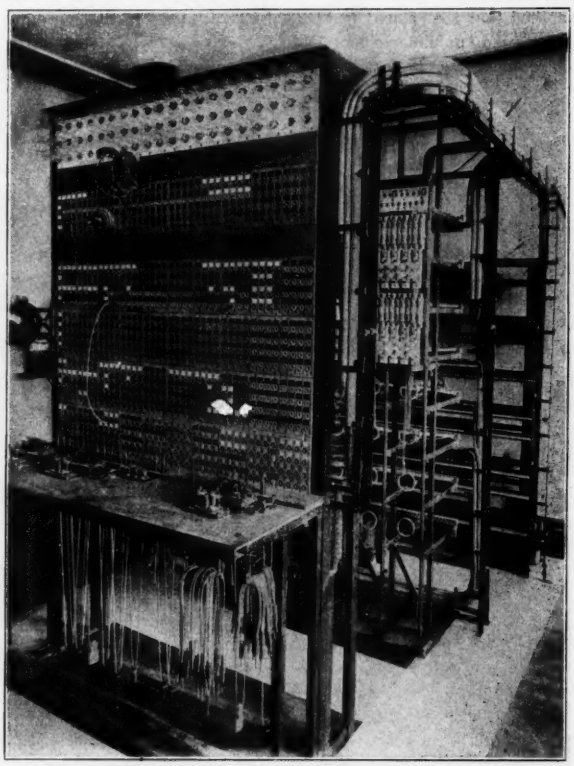
View of Tracks Looking North. Retaining Wall from Calhoun St. to Butler St.



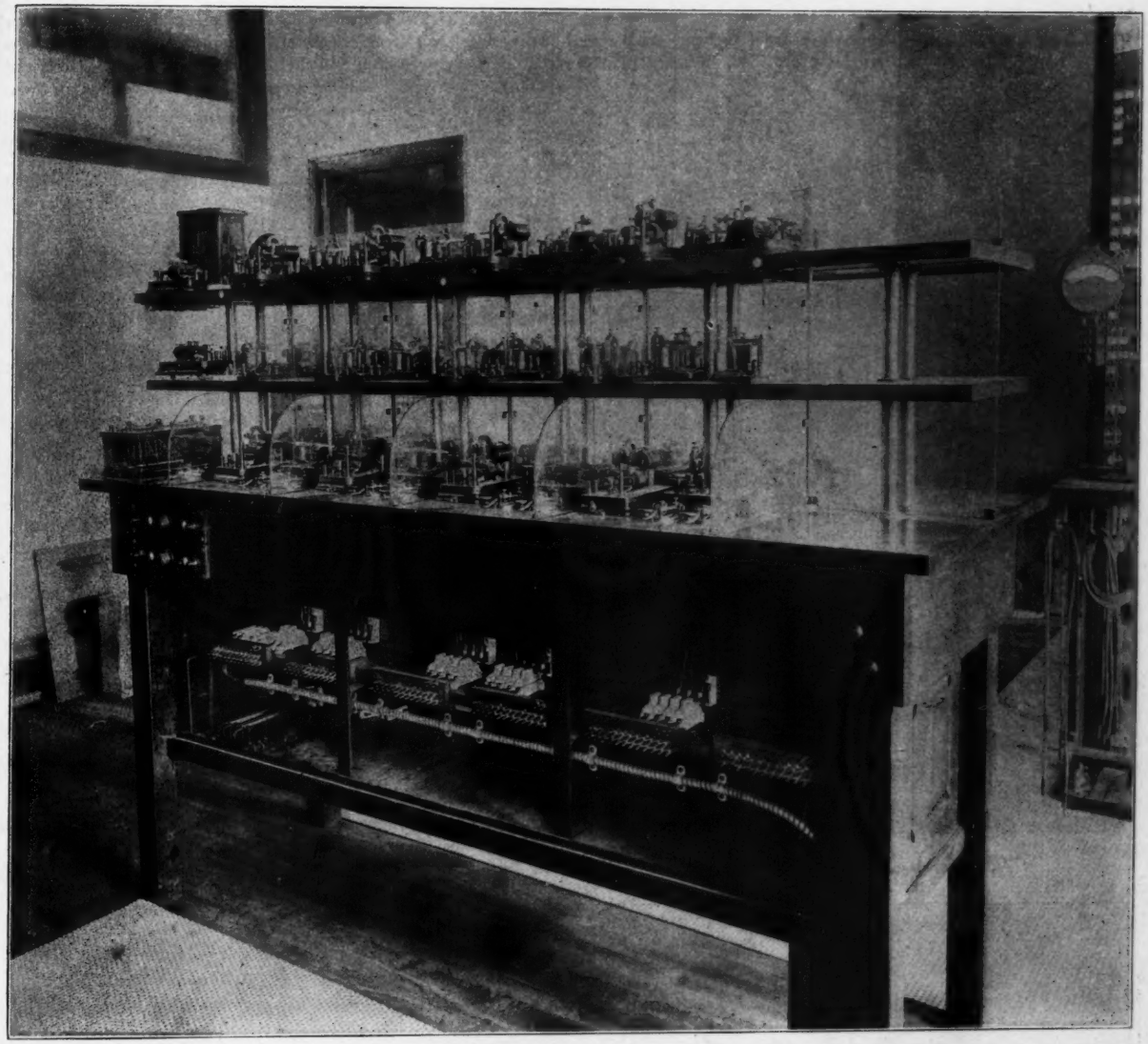
Main Street Retaining Wall, Completed.

freely interpreted classic following the lines of the Doric order above referred to. The building will be Bedford stone for the lower stories, with a combination of brick with terra cotta trimmings for the upper stories.

The interior halls are given the same general character in design, being treated according to circumstances in ornamental



New Type of Western Union Telegraph Co., Switchboard.



Telegraph Sounder and Relay Table.

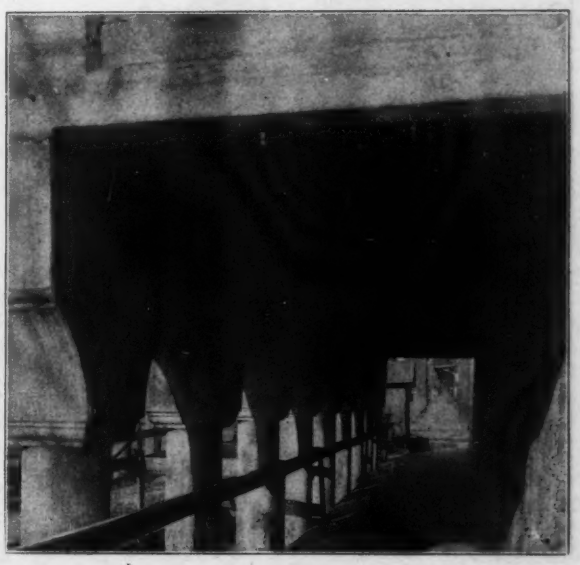
plaster with wainscoting effect of marble or enameled brick. The main waiting room in particular with its ornamental piers incased in marble will give a most handsome effect.

The tracks are provided in the station for the accommodation of passenger trains, five being through tracks and five being stub end tracks for trains which terminate at Memphis. The platforms are of ample length to accommodate the longest of trains and are provided with umbrella sheds for protecting the passengers from the weather when embarking or alighting from trains.

Trucking platforms for the handling of baggage and mail have been provided to alternate with the through passenger platform in order that the latter may be at all times entirely free for the uninterrupted passage of passengers. The mail, express and baggage business will be handled on the street level under the track from a covered driveway and be taken to the track level by means of elevators built exclusively for that purpose.

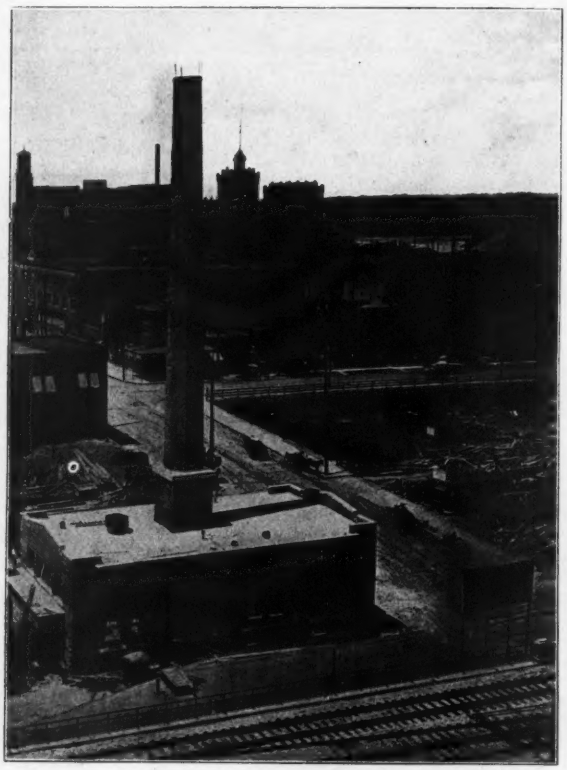
The track elevation work which was done in conjunction with the new Central Station serves to eliminate six dangerous street crossings at grade, viz.: Carolina, Calhoun, Butler, Front, Wagner and Nettleton avenues. Ample, well lighted subways of reinforced concrete construction, providing a noiseless ballast floor bridge for the passage of trains, are built for accommodating wheeled vehicles and pedestrians at each of these crossings.

The line from the new station northward to the connection with



Completed Arched Concrete Piers, South Front St. Subway.

the present tracks in Tennessee street is elevated and double track, with the exception of the block from Calhoun avenue to Butler, where three tracks have been provided, in place of the former single track that crossed all the streets at grade. The new arrangement will greatly facilitate the movement of trains between the new Central Station and the present one at Poplar street, and permit uninterrupted teaming from the warehouse district up town. The elevated tracks will also permit of the double-decked development of the business property, bringing the tracks on the second floor, while the teaming may be taken care of from the street level. This arrangement has been found to be a very practicable one and is extensively used in cities where the elevation of the tracks will permit it.



Power Station.

The tonnage of steel required in the building is about 1,200 tons and an additional amount equally, as large, was required for the work of track elevation. The cost of the entire work including track work, train sheds and track elevation will be $2,000,000.00, the cost of station proper being about $600,000.00.

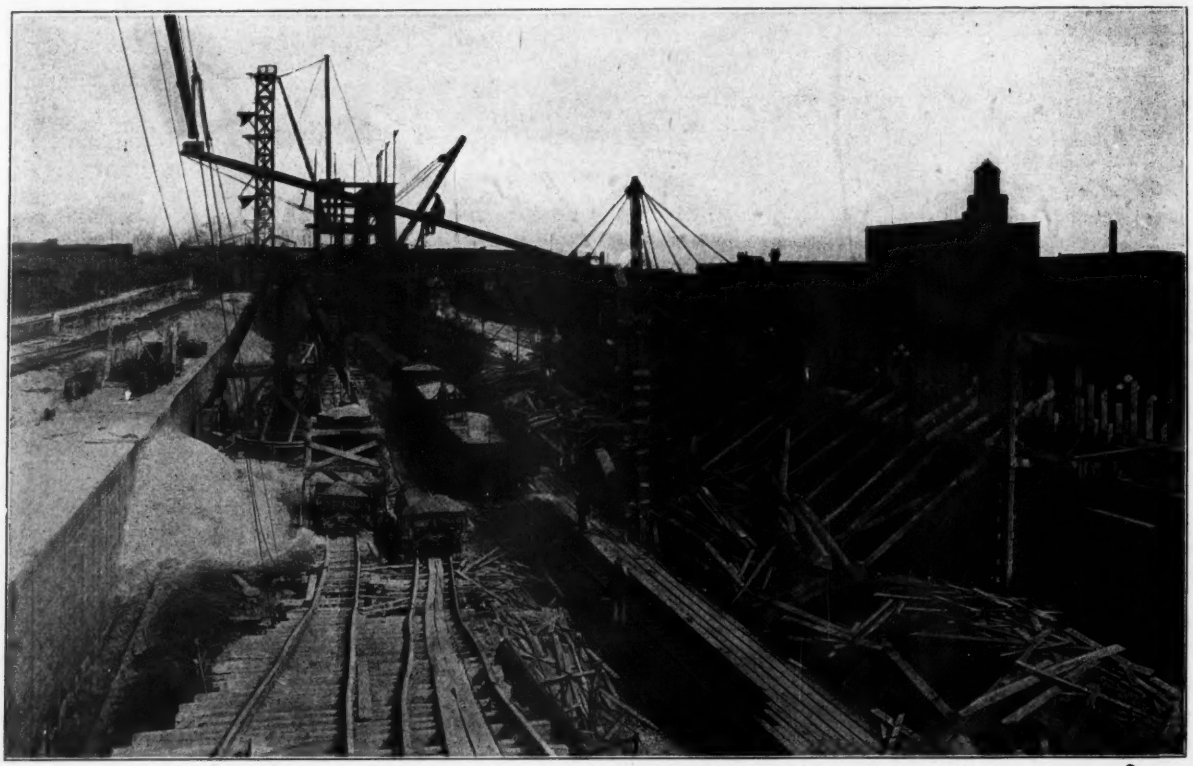
The number of men employed continuously in the construction is estimated at 200. The total area of office floor in the completed building will be 46,000 square feet.

GENERAL LAYOUT AND TOPOGRAPHY

This company formerly maintained two depots for the handling of passenger traffic in Memphis, one known as Poplar Street Station, which is located north of the business district and on the river front; the other known as Calhoun Street Station, situated at the corner of Calhoun avenue and Main street, somewhat south of the principal business district of the city.

The new Central Station occupies the same ground and takes the place of the former Calhoun Street Station. Illinois Central trains operated through Poplar Street Station, south in Tennessee street, which runs along the top of the bluff to Huling avenue, thence easterly to Nettleton avenue, running east down Nettleton avenue to an alley between Front and Main streets, thence south to the former Calhoun Street Station. The line crossed all streets at grade and was a single track from Huling avenue to Calhoun avenue.

Prior to the building of the new station passenger trains of the Rock Island and Frisco, coming in from the south, terminated at Calhoun Street Station. Passenger trains of the Y. & M. V. from the south, operated through Calhoun Street Station north to Poplar



Main St., Retaining Wall with Forms in Place on Right. Baggage Tunnel on Left.

Steel "I" Beams for Carrying Tracks Over Express Building, Showing Reinforcement in Place Ready for Concrete. Looking North.

Street Station, where they terminated. These trains now terminate in the new Central Station and have ceased running through to Poplar street.

It is anticipated the daily traffic will amount to about 60 trains, in and out, 20 per cent of these being Illinois Central, and therefore through trains, the remaining 80 per cent terminating there.

GENERAL TYPE OF BRIDGES

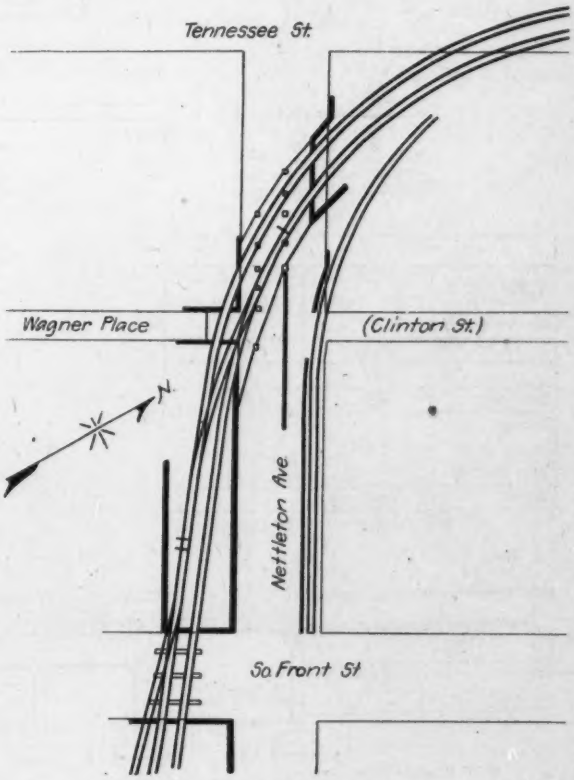
The bridges are all of permanent construction, reinforced concrete with ballast floors, the floor depths varying from 3 feet at Calhoun avenue and Front street, to 4 feet 3 inches at Carolina avenue. This variation in depth is due to the fact that a construction of I-beams encased in concrete has been used in the former streets, and, in the latter, concrete slabs reinforced with corrugated bars and I-beams encased in concrete. The I-beams were used in order to decrease necessary raise in tracks, thus keeping the approach grades as light as possible.

Piers are placed on curb lines and in middle of the street in Carolina and Calhoun avenues, Front street and Nettleton avenue, while at Butler avenue and Wagner place I-beams span the full width of the street. At Calhoun avenue supports are of structural steel encased in concrete, and columns are spaced far enough apart to permit teams to pass through from either driveway to the baggage and carriage concourse. In other streets the supports are of reinforced concrete, columns being spaced 6 feet center to center and strengthened with spiral reinforcement.

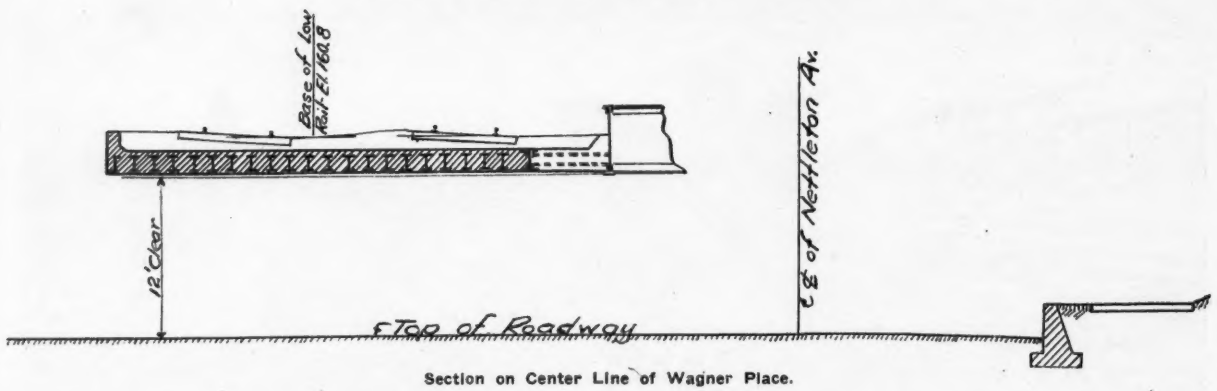
NETTLETON AVENUE AND WAGNER PLACE BRIDGE.

In the plans the difficulties in relocation of line on the south side of Nettleton avenue are shown. The buildings which were located on the south side of this street were all torn down. A small retaining wall was constructed to support the track of Miller Brothers Hardware Company and to take care of the lowered grade of Nettleton avenue and Wagner place.

The bridge over Nettleton Avenue toward the east is divided into two driveways by a retaining wall placed in center of the street, which permits entrance from Wagner Place on the north. The bridge driveway on south side of Nettleton Avenue starts downward from a point 50 feet east of the east line of Wagner



Alignment, Nettleton Ave., Wagner Place, and South Front St.



Section on Center Line of Wagner Place.

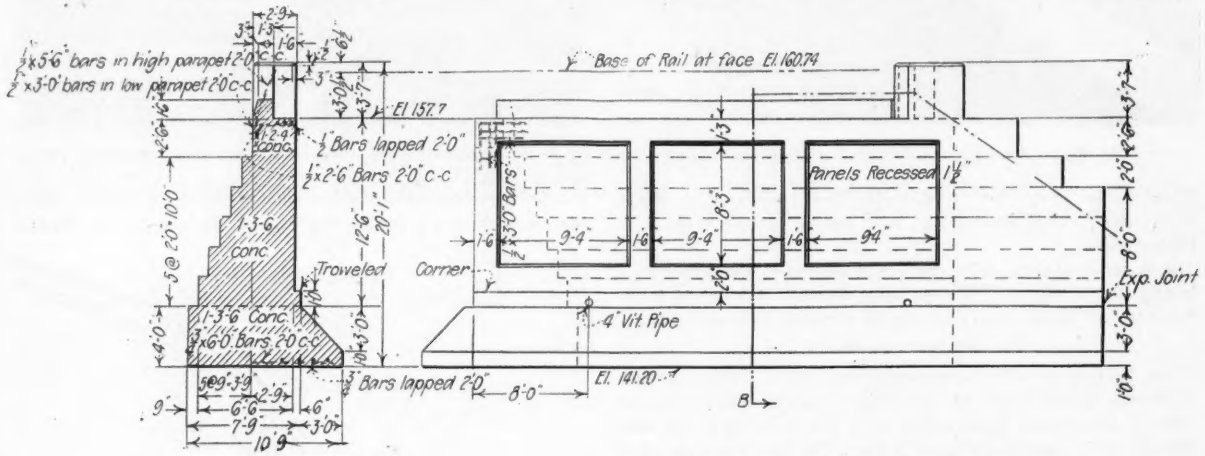
Place, at which point the north driveway ascends on slight grade, in order to provide entrance to Wagner Place from the north. Differences in grade of the two sides of the driveways, necessitated construction of a retaining wall to support the north upper driveway.

It was not possible to run to an intersection the tangents to the curve from Nettleton Avenue to Tennessee Street on account of buildings along the south side of Nettleton Avenue, just east of Tennessee Street. It was therefore necessary to make a layout to a large scale on paper, and plot in the curves.

The stub tracks across Nettleton Avenue, known as "Canale Tracks," are not to be abandoned. Under the new arrangement, these tracks will have a connection to the west with the Bluff City Belt tracks, on the elevation, crossing the Illinois Central tracks, and descending on a 4½ per cent grade across Nettleton Avenue. Formerly these tracks were operated on about a 5½ per cent grade in the opposite direction.

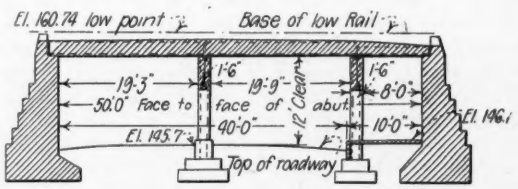
MASONRY SECTIONS.

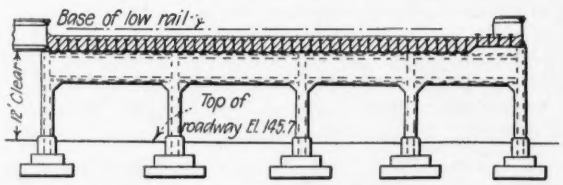
The reinforced retaining wall, which is used on the east between Calhoun and Butler Avenues, and also the one between Front

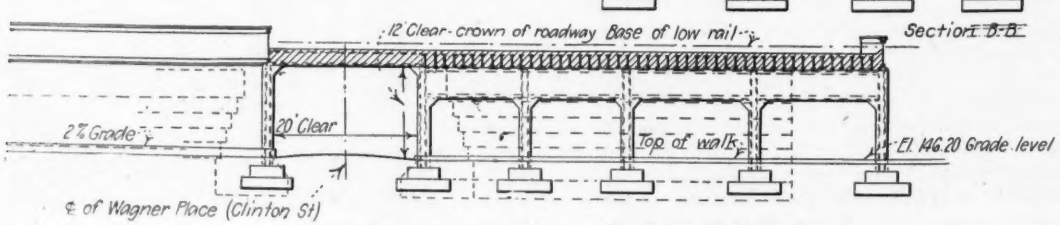


APPROXIMATE QUANTITIES		
LOCATION	CONCRETE CUBIC YARDS	EXCAVATION CUBIC YARDS
Abutment #1	350	300
" #2	280	210
" #3	420	300
Footings	65	150
Casting for Columns & Cross Girders	55	
Slabs	140	

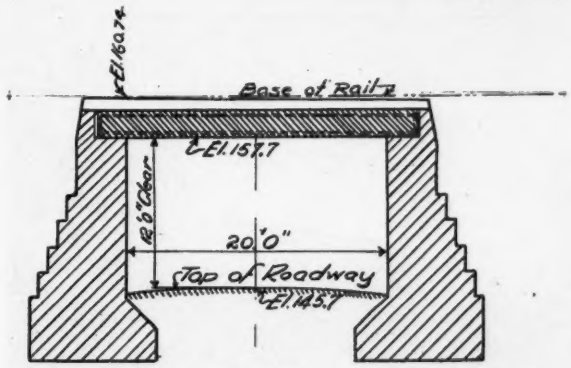
Street Excavation 1700 Cubic Yards







Details of Nettleton Ave. and Wagner Place Subway.



Section on Center Line of South Track, Wagner Place.

Street and Wagner Place, are shown in the illustrations.

The reinforced type predominates. The gravity type of construction was used in all cases except where necessary to place the face of the wall on property line, preventing use of a toe to take care of overturning movement.

PLATFORMS.

Seven platforms have been provided, two of which will be used solely for trucking baggage in connection with through tracks. The length of these platforms varies from 940 to 700 feet. The three platforms on the east are used for both passenger and trucking, and are 14 feet 5 inches in width; while the two platforms on the west, which are designed as passenger platforms, are used solely for that purpose, the trucking platforms taking care of all baggage and mail movements.

The trucking platforms are 12 feet in width, while the passenger platforms are 13 feet 2 inches in width. All platforms, with exception of trucking platforms, are provided with a covering, extending full width of the platform. This covering is in the nature of an umbrella shed, with structural steel columns and composition roof.

The passenger concourse at station end of the stub tracks is covered with wire glass and concrete roof, which is also provided with louvres to permit escape of gases which might otherwise tend to collect there.

Entrance to through tracks is by means of a concourse 25 feet in width, extending under these tracks and leading from the main waiting room, with stairways to permit passengers to ascend to the platforms at the track level.

METHOD OF CONSTRUCTION.

During construction traffic for the I. C. and Y. & M. V. was maintained on the old alignment from Huling Avenue down Nettleton Avenue and south through an alley through Front and Main Streets. The work of building Butler Avenue Subway was deferred until the last, as the former line crossed the new one at this point. The remainder of the track elevation work, including all subways and retaining walls, was carried forward without interruption. Through trains of the Illinois Central and Y. & M. V. Railroads were operated from Calhoun Avenue south on a team track located just west of the west retaining wall, thence across Broadway into present main track, south of this point.

The work of elevating depot tracks was carried on as follows: The wall on the west side first constructed and the fill started from this side and extended eastward, abandoning the depot tracks as it became necessary in order to provide for slope of the fill. As soon as possible to do so, tracks were laid on top of the fill on the west, as they were abandoned at the bottom of slope on the east.

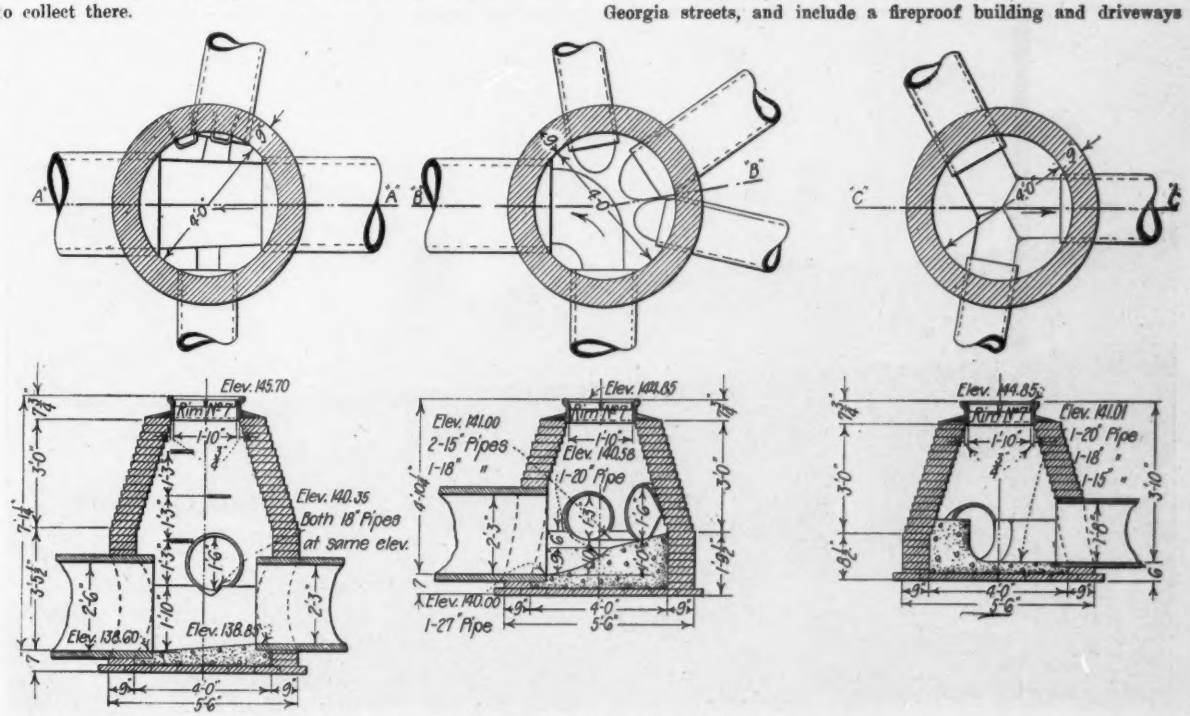
The baggage tunnel was constructed between tracks Nos. 5 and 6, counting from the east, and, as soon as the slope of fill from the west was completed to this point, the embankment work was held up until the baggage tunnel was completed.

Temporary umbrella sheds and platforms were placed on top of the fill to accommodate trains which terminated at this point, as tracks on the east were abandoned.

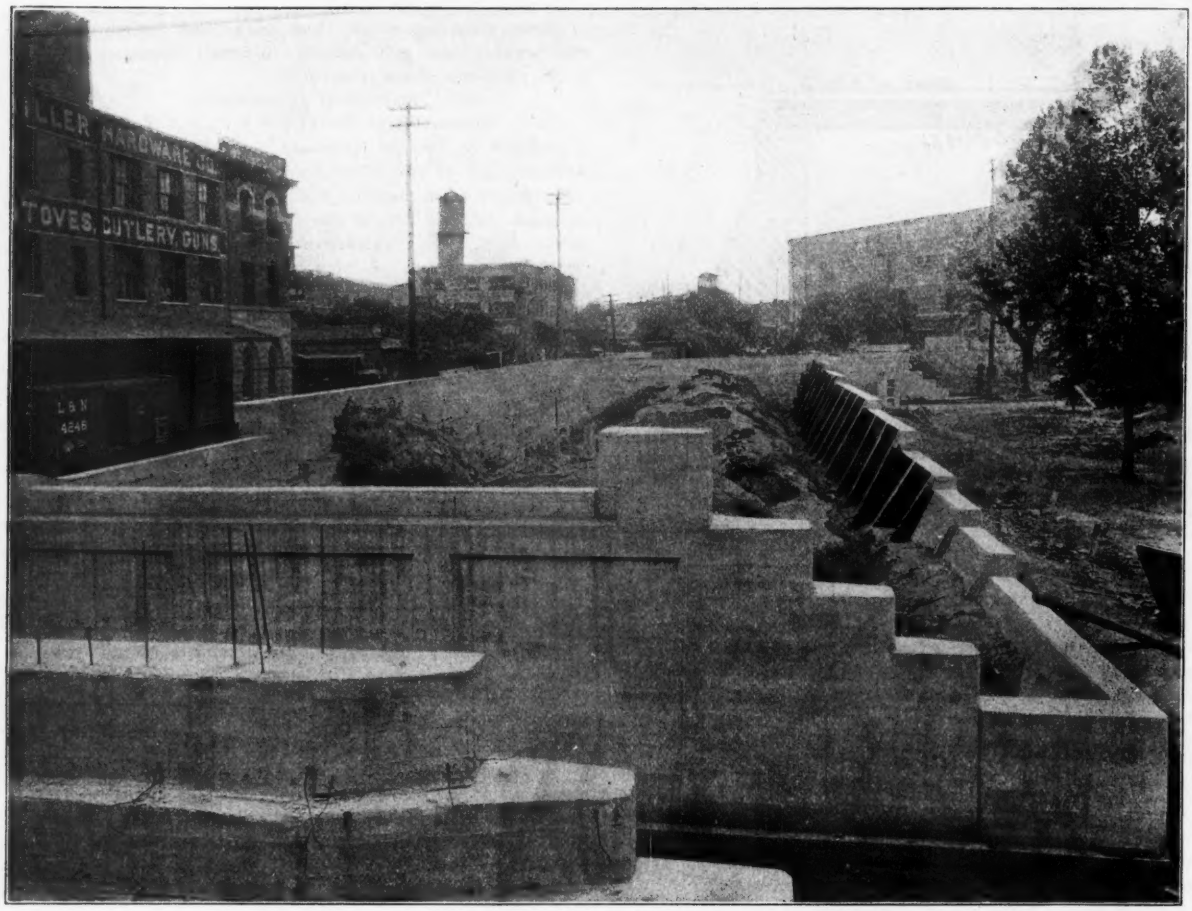
A temporary station was provided just south of Calhoun avenue, east of station building, on property which is used for the baggage and carriage concourse and part of the baggage room. Foundations for the columns which support tracks above this concourse were constructed before the temporary depot was started. Work of erecting the steel supports for tracks overhead was done while the building was being occupied. A temporary elevator was installed for handling baggage in the temporary depot up to the elevated track level, this elevator being operated by an electric motor.

THE EXPRESS BUILDING.

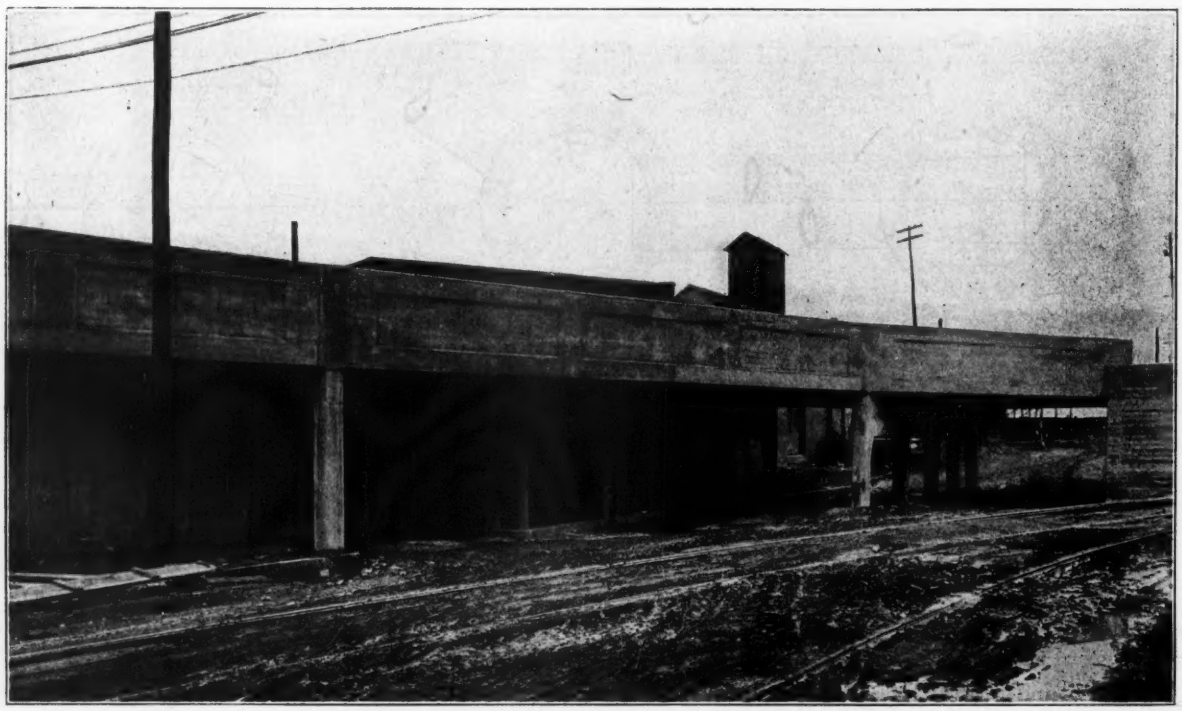
These facilities are located at the northwest corner of Main and Georgia streets, and include a fireproof building and driveways



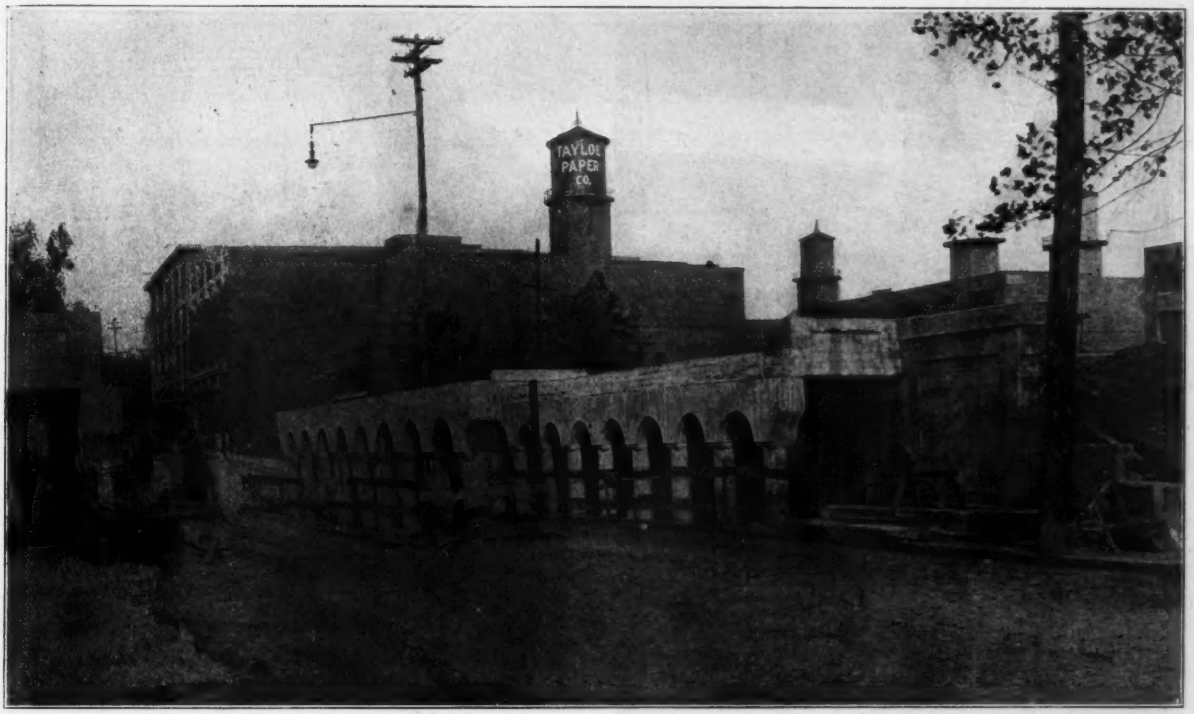
Details of Manholes for Storm Sewers, Nettleton Ave. and Wagner Place.



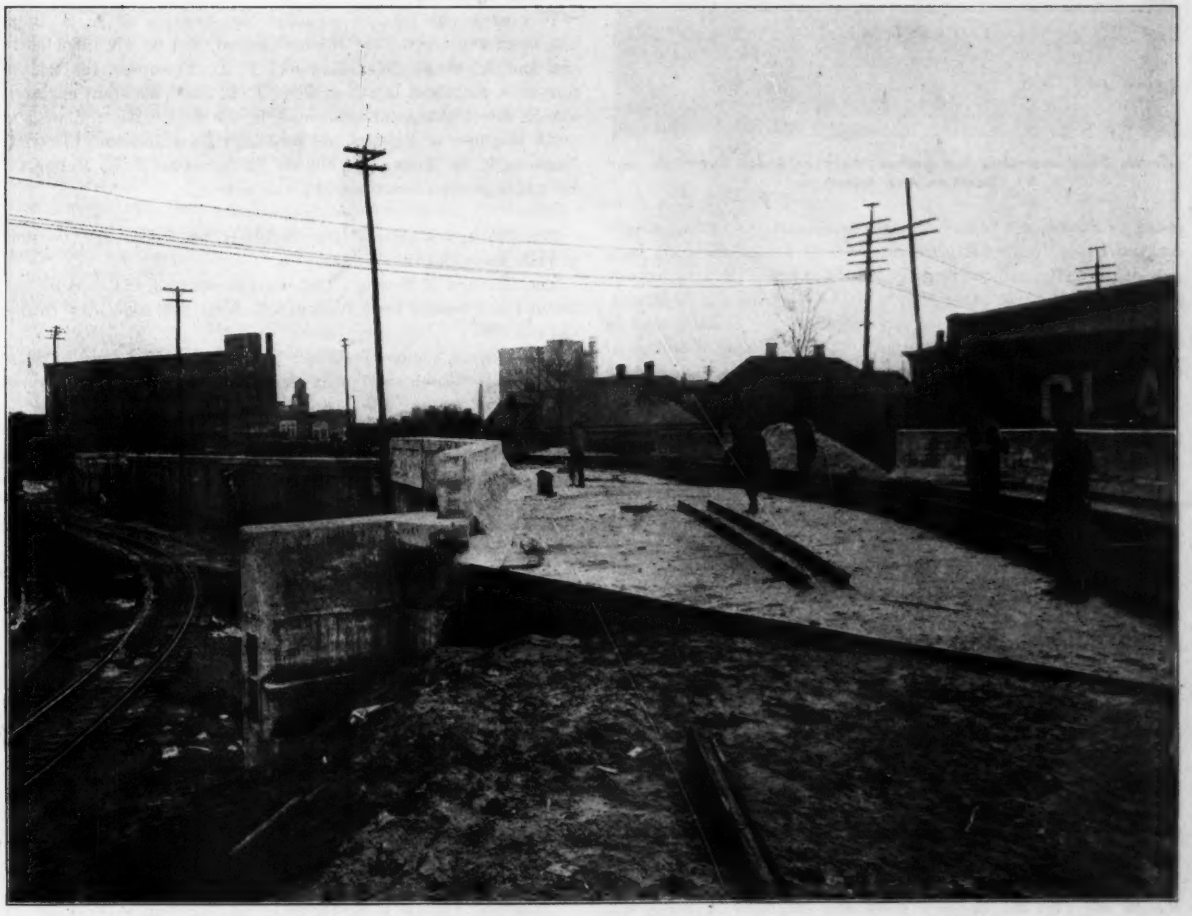
Track Elevation, Wagner Place Retaining Wall, Showing Water proofing Pitch on Inside.



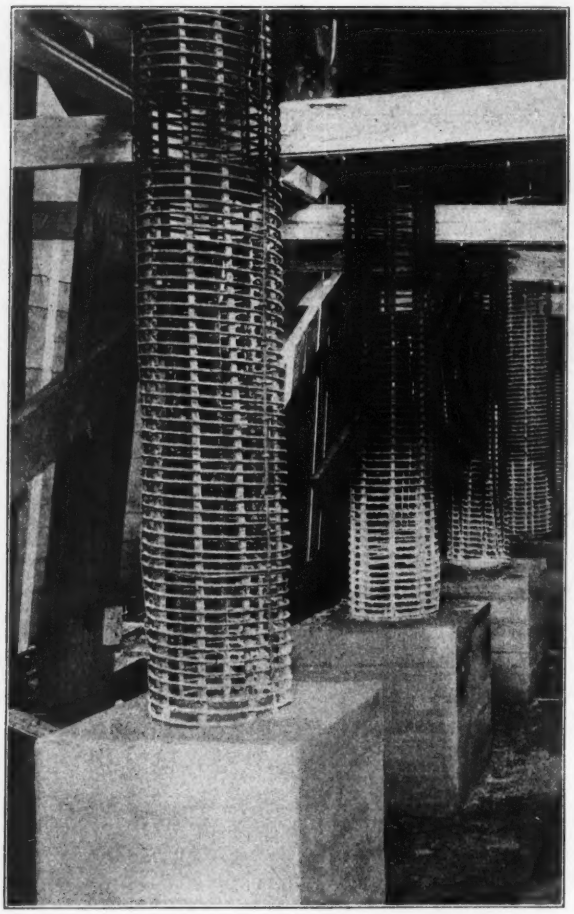
Nettleton Ave. Subway Completed, Excepting Street Paving.



Arched Concrete Piers, South Front St. Subway.



Nettleton Ave. Subway, Showing Concrete Deck Completed, Except ing Waterproofing Fabric.



Column Reinforcements for Arched Piers at South Front St. and Carolina Ave. Subways.

paved with creosoted blocks for the accommodation of the American and United States Express companies. An entrance has been provided directly into the baggage tunnel in order that the express may be handled in the baggage elevators to the track platform level.

The commissary department is located in this building and is well arranged with good storage capacity and equipped with separate ice boxes for the three roads using the station, the Illinois Central, the Frisco and the Rock Island.

Well lighted stationary bins and shelves are provided here. The bins being 82 ft. x 14 ft. 3 in. in heighth. The shelves and letter files being 8 in., 16 in. and 12 in. deep, as required.

The sewage system of this building is very complete, with plenty of capacity, 12 in. and 15 in. vitrified pipe being used for the main branch lines.

The transformer, located here, is of concrete construction, with interior of doors and door frames of fireproof construction. The shelving is concrete and the ventilation well taken care of by ample window space with wooden louver construction.

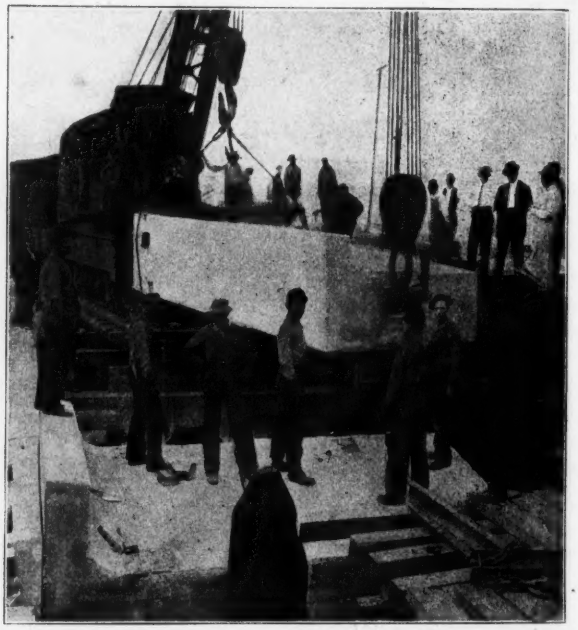
The canopy of the Georgia avenue platform is of reinforced concrete and "I" beam construction and of graceful design.

All the floors of the building are laid with the mastic covering.

The United States mail service will be handled in the space allotted for that purpose on the first floor plan of the depot.

The James Alexander Construction Company, of Memphis, Tenn., were awarded the contract for construction of the depot building, plans for which were drawn by D. H. Burnham & Co., architects, of Chicago.

The structural steel work for supporting the tracks across the streets and over the baggage room and concourse driveway was awarded to the American Bridge Company.



Setting Floor Slabs for Subway Carolina Ave. Weight of Slab 40 Tons.

The Bates & Rogers Construction Company, of Chicago, had the contract for masonry and excavation work, in accordance with the track elevation.

This work was carried on under the direction of A. S. Baldwin, chief engineer of the Illinois Central, and we are indebted to him and Assistant Chief Engineer F. L. Thompson for the information contained in this article. F. R. Judd, assistant engineer, was in direct charge of the work in the field. We also wish to thank Engineer of Bridges and Buildings Maro Johnson, Electrical Engineer E. W. Jansen and Official Photographer J. K. Melton for assistance rendered in compiling this article.

The Chicago & Alton, it is reported, has ordered 7,200 tons of rails from the Illinois Steel Co.

The Chicago & Western Indiana has ordered 465 tons of material for a bridge near Dalton, Ill., from the American Bridge Co.

The Denver Union Terminal has ordered 700 tons of steel for the new Union station at Denver, Colo., from the American Bridge Co.

The Northern Pacific has opened bids for grade separation throughout the city of Spokane, Wash. The work, including erection of new depot, will involve an expenditure of about $5,000,000.

Track laying on the Orange Northwestern will probably be started soon. Ed. Kennedy, Houston, Tex., is president.

Track laying on the extension of the Orange Northeastern from Vinton, La., to a connection with the Kansas City Southern, six miles north, will begin in about six weeks.

The Alabama Great Southern has let a contract to H. C. Elkins, Baltimore, Md., for eleven miles of double-track work between Birmingham, Ala., and Mobile Junction.

The Altus, Lubbock & Roswell will have 86 miles of line between Lubbock and Memphis, Tex., in operation in a few months, and construction started on the 100-mile section from Lubbock to Roswell.

The chamber of commerce, Pine Bluff, Ark., has petitioned the Ashley Drew & Northern to construct a road into Pine Bluff, and a route is now being surveyed betwen Pine Bluff and Monticello.

Atchison, Topeka & Santa Fe is making final surveys for extension from City Park to Tros, N. Mex.

CONCRETE DEPARTMENT

CURRENT PRICES — CONCRETE MATERIALS.

Portland Cement—The cement market has remained practically the same since last month, except in certain localities, and the demand is about the same; on the Pacific Coast the market is very dull, everyone seems to be waiting to get the real effect of war on business. At present there is no foreign demand. Prices given f. o. b. cars at points named, including cloth sacks, for which, in general, 40c per barrel (4 sacks) is refunded on return in good condition. Prices per barrel (including 4 cloth sacks) are as follows: Boston, $1.72; New York, $1.58; Chicago, $1.55; Peoria, $1.64; Pittsburgh, $1.55; New Orleans, $1.64 on dock; Memphis, $1.82; Cleveland, $1.63; Cincinnati, $1.68; Detroit, $1.59; Indianapolis, $1.65; Columbus, $1.67; Toledo, $1.59; Dayton, $1.65; St. Louis, $1.55; Milwaukee, $1.64; Madison, $1.62; Minneapolis and St. Paul, $1.75; Toronto, $1.95; Kansas City, $1.63; Davenport, $1.65; Cedar Rapids, $1.75; Omaha, $1.68; Portland, Ore., $2.30; Spokane, $1.75; Seattle, $2.30; Tacoma, $2.30; Duluth, $1.78.

Crushed Stone—1½ in. stone, prices per cubic yard, f. o. b. cars in carload lots, unless otherwise specified. Boston, 80c per ton at the quarry; New York, 90c to $1.00, in full cargo lots at the docks; Chicago, $1.15; Spokane, $1.75, Seattle, $1.25; Portland, Ore., $1.15.

Gravel—Prices given are per cubic yard f. o. b. cars in carload lots unless otherwise noted. Boston, 75c; New York, 90c to $1.00, in full cargo lots at docks; Chicago, $1.15; Portland, Ore., 85c; Spokane, $1.25; Seattle, 75c; Tacoma, 75c.

Sand—Prices are per cubic yard, f. o. b. cars in carload lots unless otherwise indicated. New York, 50c, full cargo lots at docks; Chicago, $1.15; Toronto, $1.15; Portland, Ore., 85c; Spokane, $1.00; Seattle, 75c; Tacoma, 75c.

Reinforcing Bars—The demand and prices in general about the same as last month. Pittsburgh base quotations on mill shipments f. o. b. cars are from $1.20 per cwt., with the prevailing extras on bars under ¾ inch or base. The following are quotations on base bars per 100 lbs., for mill shipments from other points, f. o. b. cars: New York, $1.36; Philadelphia, $1.35; Chicago, $1.38; Portland, Ore., $1.80; Spokane, $2.20; Seattle, $1.80; Tacoma, $1.80.

Shipments from stock are being made at the following prices per cwt. f. o. b. cars: Pittsburgh, $1.65; New York, $1.85; Cleveland, $1.80; Cincinnati, $1.85; Chicago, $1.85; Portland, Ore., $2.00; Spokane, $2.50; Tacoma, $2.00; Seattle, $2.00.

Metal Clips for Supporting Bars—$5.50 to $6.50 per 1,000, depending on size.

For the majority of the prices given we are indebted to the Universal Portland Cement Co., Sandusky Portland Cement Co., Concrete Steel Co., American Sand & Gravel Co., Chicago, and F. T. Crowe & Co., Seattle, Portland, Spokane and Tacoma.

Reinforcing bars for mill shipments are in general sold on a Pittsburgh basis; this is, at the Pittsburgh quotations plus the freight to the point in question, and with the following list of freight rates on finished material and the Pittsburgh quotation

From Pittsburgh, carloads, per 100 pounds to:

Albany	16 cents	Birmingham	45 cents
New York	16 cents	Columbus	12 cents
Philadelphia	15 cents	Cincinnati	15 cents
Baltimore	14½ cents	Louisville	18 cents
Boston	18 cents	Chicago	18 cents
Buffalo	11 cents	Richmond	20 cents
Norfolk	20 cents	Denver	84½ cents
Cleveland	10 cents	St. Louis	22½ cents
Minneapolis	32 cents	New Orleans	30 cents
Kansas City	42½ cents	Indianapolis	17 cents
		Omaha	42½ cents

REINFORCED CONCRETE CHIMNEY AT THE BURNSIDE SHOPS, I. C. R. R.

By A. M. Wolf, C. E.

A reinforced concrete chimney with a total height of 216 ft. from bottom of foundation to top of stack was built during the winter of 1911-12 at the Burnside Shops of the Illinois Central Railroad in connection with the extension of the shops. The finished stack shown in the accompanying illustration is an excellent example of the possibilities of reinforced concrete for tall chimney work.

DETAILS OF DESIGN.

The stack with an outside diameter of 19 ft. 10 in. at the base rests on a footing 32 ft. square and 5 ft. thick, founded on 100

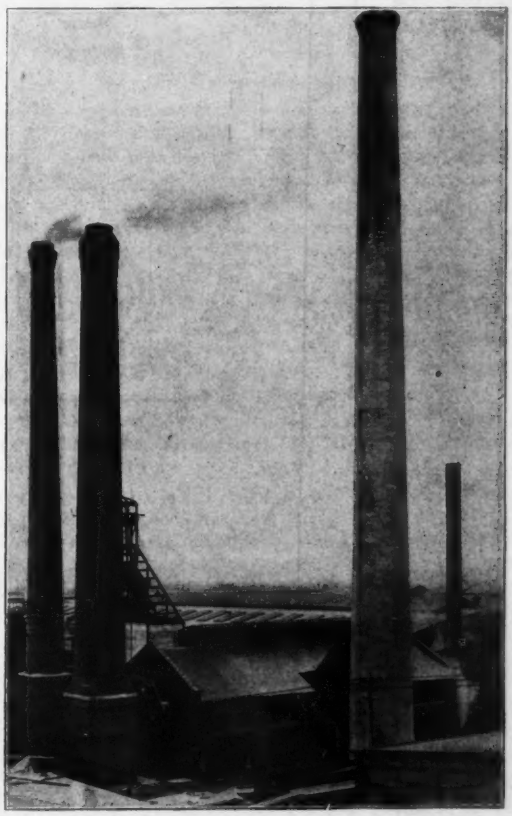


Fig. 1.—Reinforced Concrete Chimney, 216 Ft. High, Burnside Shops, Ill. Cent. R. R.

wood piles driven 3 ft. 3 in. centers both ways. The footing is reinforced with two layers of straight bars just above the top of piles in order to uniformly distribute the load over the entire area. Nearly 200 cubic yards of concrete were used in the foundation.

At the base the stack wall is 16 in. thick and 19 ft. 10 in. outside diameter, while at the top the thickness is 6 in. and the outside diameter 11 ft., the stack being given a uniform taper. To provide for the tensile stresses due to wind pressure the stack is reinforced at the base with 94 ¾-in. vertical bars at a uniform spacing near the outer edge of the shell. The number of vertical bars decreases toward the top, as shown in Figure 2, the detail plan, the upper 40 ft. being reinforced with 14 ½-in. bars. Horizontal reinforcing to provide for temperature stresses, a triangular wire mesh given, the prices of bars at any of the points listed can be readily computed.

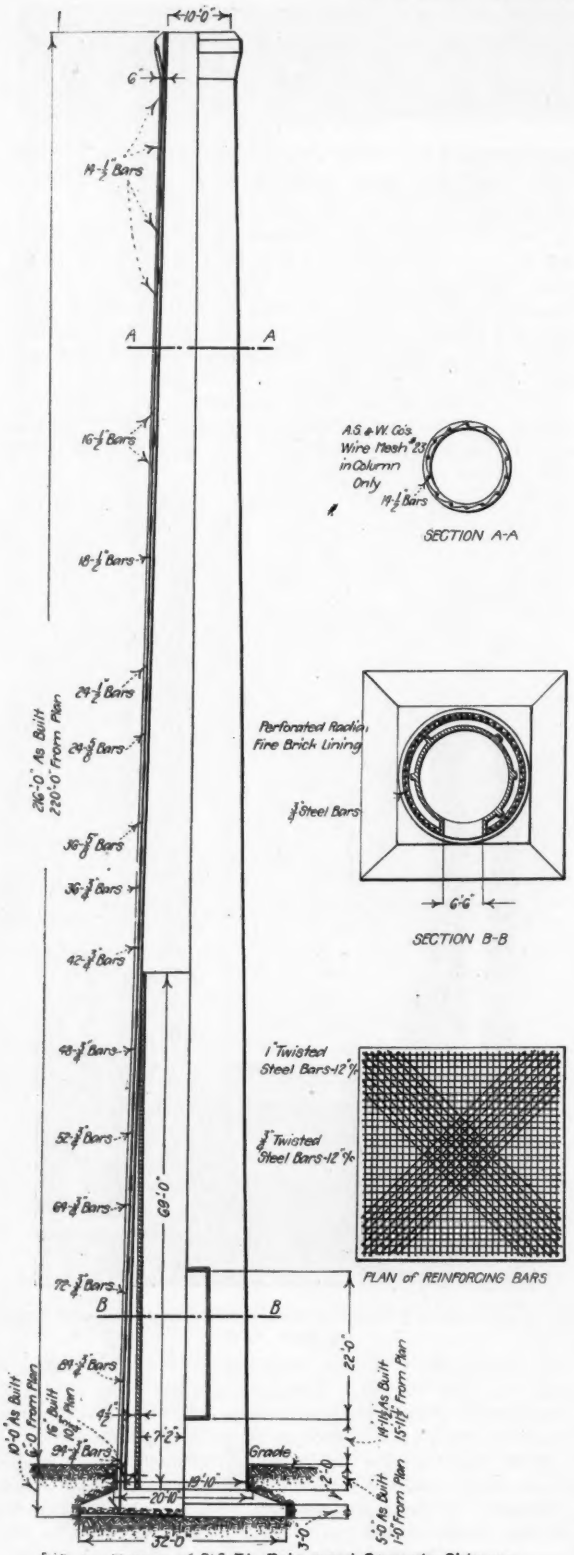


Fig. 2.—Details of 216 Ft. Reinforced Concrete Chimney.

(A. S. & W. Co.'s No. 23) with a cross-sectional area of 0.147 sq. in. per ft. of width was interwoven horizontally around the vertical bars.

As a protection to the concrete in the lower portion of the stack a 4½ in. fire-brick lining 60 ft. high was placed inside the concrete shell, making the inside diameter at the bottom 14 ft. 4 in. The lining is braced by six brick pilasters on its outer circumference next to the concrete shell. The flue opening near the bottom is 22 ft. by 6½ ft. wide. Lightning rods at the top of the stack are grounded by copper cables extending up through the concrete shell.

The stack was built in sections 4 ft. 2 in. high by means of two sets of forms. The first forms used were of wood, but later adjustable steel forms were employed to give the desired taper. After the concrete in the lower form had become hard, the form was opened up in sections and lifted up above the other form and set in place by means of block and tackle operated from a scaffold built up on the inside of stack and kept at some distance above the point where concrete was being poured. The concrete was hoisted in a bucket attached to a cable and operated by a hoisting engine. From the working platform the concrete was distributed to the forms by chutes.

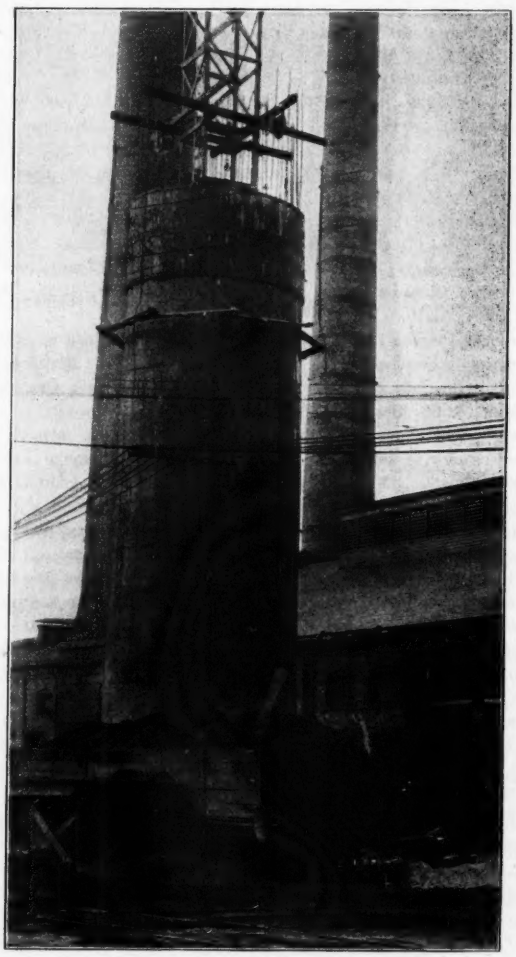


Fig. 3.—Construction View, Showing Steel Forms and Hoisting Apparatus.

The work being carried on mostly during the winter months, all concrete materials were heated, and when the temperature dropped below 28 degrees F. work was suspended. With the coming of relatively warm weather eight or nine sections were built in one week; a record of four sections in two days was the best obtained. Due to continued cold weather, the progress made on the lower portion of the stack was very slow. The workman reached the top of stack either by ladder on the inside or by being hoisted in the concrete bucket.

After completion the outside surface was given a cement grout wash and an iron ladder erected. The stack was built by contract by the M. W. Kellogg Co., of New York.

The writer is indebted to Mr. A. S. Baldwin, Chief Engineer, and Mr. W. Koestner, Smoke Inspector, for data and photographs used herein.

The Roadmasters' and Maintenance of Way Association of America in Convention.

The 32d annual convention of the Roadmasters' and Maintenance of Way Association was held in Chicago at the Auditorium Hotel from September 8th to 11th.

Mr. T. F. Donahoe, general supervisor of the Baltimore & Ohio R. R., president of the association, presided at the session. The opening meeting was called at 10 a. m., on Tuesday, Sept. 8. An address of welcome was made by Mr. Mathias, representing the mayor of Chicago. Mr. R. H. Aishton, vice-president of the Chicago & NorthWestern Ry., followed with an address on practical phases of the roadmaster's work, which filled the audience with enthusiasm. Then addresses were made by the following past presidents of the association: Mr. T. Thompson, Atchison, Topeka & Santa Fe Ry.; Mr. William Shea, Chicago, Milwaukee & St. Paul Ry.; Mr. James Sweeney, Chicago & Eastern Illinois Ry.; Mr. Andrew Clough, New York Central & Hudson River R. R., and Mr. J. A. Kerwin, Chicago, Peoria & St. Louis R. R.

The secretary, Mr. L. C. Ryan, reported 161 candidates for membership, and by vote of the convention all of these were received as new members. The cash balance on hand, as reported, was $687.57. The association was declared to be in good standing, both financially and as to membership. President Donahoe read his annual address, which closed the proceedings of the forenoon session. Following are extracts from this address:

"There is no work of railroading that needs as much attention as the care and maintenance of track. In the great strife for business, freight and passenger rates have been reduced to a minimum, and to meet these conditions the speed of trains, the load capacity of cars and the weights of engines have nearly been doubled. These conditions demand a first-class track. A track to be first class must have first-class material, be properly constructed and have a proper organization for maintaining the same. For this reason the Roadmasters' and Maintenance of Way Association was formed thirty-one years ago by practical trackmen. It has grown until we now have approximately 800 members.

"We must reach conclusions after joint discussions and tests of various methods and material. For this we have our organization. Let us make it as effective as possible. The responsibility rests with the present members. Each member should be willing to make some sacrifice and do his part and show his willingness to act as the occasion arises and the courage to fail if necessary after making an honest effort. We are always hoping for something. Hope is like a powerful engine; it looks fine as it stands on the track ready for action, but the steam must be turned on, as the engine's beauty counts for nothing. The courage we have is the steam. The brave hope on and believe they will succeed through courage. Hope is the engine and courage is the steam that drives it along. Hope is the man; courage is the goods; hence hope with courage is the man delivering the goods.

"Coming from all parts of the country, how are we to find out what subject each member is most interested in? We pick subjects, then select committees to get them in shape for discussion. The chairmen with the assistance of the other members do their best to bring the subject before you in a manner to be discussed, not always expecting you to agree with them. So in opening this convention let each member consider himself a committee of one to have something to say on the subjects under discussion, keeping as near the point as possible and avoid being touchy when the other fellow fails to think as you do. It is to be hoped each of us has given the various subjects some thought and are ready to tear the reports to pieces and rebuild them to suit the views of the majority of the members present. As chairman I feel that I have a hard task to perform, but I shall do my best to give you all a square deal and will endeavor to rule without fear or favor."

At the afternoon session on Tuesday, committee reports were taken up, the first one considered being on "New and Improved Track Tools, Manual and Power Driven," introduced by Mr. J. W. Dahl, supervisor with the N. Y. C. & H. R. R. R. This report received a long discussion, and Mr. Dahl's comments were received approvingly. A good part of the discussion was devoted to the question of motor cars for section crews, and the sentiment that sections should not be lengthened or the number of foremen reduced, as a measure of compensation for adopting the use of motor cars, was strongly voiced by every member who spoke. A few members said that they could not recommend motor cars for busy divisions, but it was apparent that the majority of speakers were highly in favor of motor cars for their section crews and had adopted them in service out of considerations of economy.

COMMITTEE REPORT.

NEW AND IMPROVED TRACK TOOLS, MANUAL AND POWER DRIVEN.

By J. W. Dahl, Supervisor N. Y. C. & H. R.

(Extracts.)

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2. SECTION MOTOR CARS.

(a) The use of section motor cars is considered by your committee an important development toward increase in efficiency.

(b) There have been diverging views existing among some railroad men concerning the advisability of installing motor cars on sections and while their use may not be equally advantageous on all territories it is evident to your committee, after careful investigation and actual experience by some of its members in the use of these power driven cars, that there is absolutely no doubt of the economy and advantages in their use as following illustration will show:

Price of one hand car	$ 36.00
Supposed miles it will run until worn out, 60,000.	
Labor cost to run hand car 12 mi. per hour, 5 men and foreman	.0906
Depreciation and wear of car	.0006
Total	.0912
Motor car	$200.00
Fuel, including repairs per mile	.0173
Depreciation and wear of car per mile	.0034
Men's time including foreman riding on car 20 miles per hour	.0505
Total	.0712

A saving of 0.02 per mile in favor of the motor car.

(c) After a study of the above facts, we recommend their adoption on sections, instead of hand cars, on the same basis of foreman and men now allowed, as experience shows that greater efficiency and longer hours of work are secured and men are more easily obtained on sections where they now have been installed, and, therefore, their adoption will help to a certain degree to increase the amount of work accomplished per day per man.

4. RAIL HANDLING MACHINES.

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Where heavy ditching has to be done in the spring and autumn, machines that can be utilized for ditching and handling rail should be assigned, while in territories where ditching is very light machines operated by air seem to answer the purposes more suitably, but under all conditions rail should be handled by power driven machinery, as this kind of work can be done at a cost of 50% less by power than by manual labor.

5. RAIL BENDERS AND CURVERS.

This is a subject which requires careful consideration owing to the fact that with the advent of heavy rail it is necessary to curve all rails laid on curves of 6 degrees and up. There are a number of machines now on the market but all of them are too slow and require too much manual labor to operate; and inasmuch

as it now requires almost as much and in some instances more time to prepare rails for laying on roads with many curves, we recommend that all rails that must be curved shall be curved at the mills. We also recommend the use of the lightest rail bender that will kink the rail used.

6. RAIL LAYING.

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If, however, machines were substituted so that rails could be laid with a smaller force, a great saving in the cost per lineal foot of track laid would thereby be obtained. We recommend its general adoption as a labor saving device.

SNOW HANDLING MACHINERY AND MODERN METHODS OF REMOVING SNOW FROM INTERLOCKING PLANTS.

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(c) From experience it has been found that the Hydro-Carborn method of cleaning snow from switches is more effective than any other. The switches, intricate mechanism of interlocking, etc., in busy yards by this method are kept in working order by the regular, experienced forces during the heaviest snow storm. This method consists in melting the snow by pouring upon it ignited Hydro-carbon oil, a volatile liquid comparable to gasoline.

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This method is very efficient in removing snow from the intricate mechanism of interlockings, switches, slip crossings, etc. It is estimated that the efficiency of a man at interlockings is increased two to three hundred per cent by using the hydro-carbon cleaning method.

DITCHING MACHINERY.

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The ditching should be done by machinery, in order that the biggest quantity that possibly can be moved in a short time will be removed from cuts while work train has the main track.

MISCELLANEOUS.

Under this head almost every tool used in maintenance work could be mentioned. In passing we might speak of lining jacks, ratchet track wrenches, tie adzing and boring machines, appliances for drawing screw spikes, etc., etc.

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To conclude, I wish to state that the New York Central is now trying out a tamping machine, but am unable to give any data on its performance, but I am positive that the inventor of that machine has taken a step in the right direction and more moves of this kind will soon solve the difficulties under which we are now working.

DISCUSSION.

Chairman Dahl stated that in lining or throwing track, men are ordinarily distributed at intervals of 2 ft. along the tracks. A 2-ft. section of track weighs 182 lbs., while the resistance against throwing laterally is 10 times this amount or 1,820 lbs. The average man can lift his own weight, or 142 lbs. With a lining bar he can lift four times his own weight or 568 lbs. He also deprecated the tendency to install motor cars as a substitute for section foremen, stating that the foremen have all they can do and that increasing the length of sections adds to their duties and decreases their supervision and efficiency in direct proportion.

P. J. McAndrews, C. & N. W. Ry., stated that in his opinion the use of motor cars could save the work of one man on every crew of six or eight laborers.

M. Donahoe (C. & A.) stated that he did not believe motor cars would make as great mileage during their life as hand cars. He also called attention to several types of engines which can be attached to hand cars at an initial expenditure considerably less than the $200 referred to in the committee report.

W. F. Muff (A. T. & S. F.) stated that while he has several such cars on his sections, his company does not allow the men to purchase their own cars, but that if they are considered advisable, the company purchases the engines and mounts them on the hand cars. Other members stated that their roads allowed the men to purchase their own engines and mount them on the hand cars if they desired.

J. Buel (Ark. Cent.) has used motor cars for five years and has been able to eliminate alternate sections by their use.

There was quite a diversity of opinion regarding the best type of rail loading machine to be used under different local conditions. The E. J. & E., D. O'Hern stated, uses a locomotive crane with a magnet in loading scrap. This machine will pick up twelve 33 ft. 100-lb. rails at one time.

After much discussion regarding the necessity for curving rails, the association voted to amend the report, that when it was necessary to curve rails they should be curved at the mills.

C. King (L. I.) and A. M. Clough (N. Y. C. & H. R.) described the operation of a type of tie tamping machine, 12 of which are now in use on the New York Central. This machine is mounted on a push car, is self-propelled and is driven by a gasolene engine operating an air compressor. It works similarly to a riveting machine, with two tampers having a stroke of about 1½ in. This machine requires two men to operate it and will tamp 350 to 450 ft. of track per day, replacing 10 men.

PROPER METHOD OF RAIL RENEWALS.

By A. M. Clough, N. Y. C. & H. R.

(a) In preparing a report on the "Proper Methods of Rail Renewals," your committee fully realizes the importance of this question at this time. The enormous increase in the weight of motive power and rolling stock, the higher speed of trains, the larger number of broken rails, the much closer supervision given this matter by the government, together with the untiring efforts put forth by both the rail designers and rail manufacturers to improve upon past and present conditions, all tend to make this question prominent. We feel it is our duty to give our brother roadmasters the very latest approved methods of replacing old, worn or lighter sections with new or relayer rails and see that the same is used so as to entirely remove any suspicion of blame for rail failure or accident from this cause by poor application or maintenance of newly laid rails.

(b) That many different methods do now exist among our members of this association, also that many of us suffer from not having rail renewals made as soon as they should be, is quite evident to your committee, both from personal conversation and from correspondence with our fellow members, so that:

First. We believe that the roadmaster or supervisor of track who is in immediate charge of a division should be the one to recommend when rail should be renewed. He sees it under all conditions; sees it either too light or gradually deteriorating under traffic, and knows from year to year just how much more difficult and expensive it is to maintain worn out rails or rails that are too light for the traffic with which they have to contend. His recommendations for renewing certain portions of his territory should be considered carefully, while the question of the weight of the new rail to be laid could, or should, be determined by the chief engineer or other officials conversant with the probable increase in traffic or tonnage, or acceleration of speed contemplated over that district, which is not always known to the man in charge of the track.

Second. Rail should be laid as early in the spring as possible, weather and other conditions permitting. It should be furnished from the mills on flat cars when practicable and all full length rails should be loaded separate from short lengths.

Third. Rails loaded in gondola cars should be unloaded with a power unloader operated by air or steam as provided. Rail can be unloaded with skids from the side of the car or by pulling them off from the ends of cars with an incline arrangement to permit the rail to reach the ground easily, the main object of all concerned being to use care so that rail will not be injured while being unloaded.

Fourth. Rail should be laid with broken joints, that is, the joint on one side should be in the center of the rail opposite. In laying rail around curves, rails cut from six to twelve inches shorter at the mills should be used on the inside of curves so that a joint on the shorter radius of the inside rail would never get more than from three to six inches ahead of the center of the

rail opposite until a short rail is put in. Any extra effort to keep joints properly broken being fully repaid in the proper spacing of ties on curves, one of our most vital points on track.

Fifth. Rails shorter than the standard lengths should be marked green on the ends, except those cut special for curves—those should be marked red. All second quality rails should be marked white. Full length rails, of course, not needing to be marked.

Sixth. Rail should be laid into track one rail at a time and great care should be used to see that they are not bumped against the last rail laid in. Proper expansion shims should be used to keep the rails the right distance apart according to the weather conditions. The shims should be made of hard steel. Rails of the same width of base should be laid from the inside which will permit the ties to be adzed and rail set up level without interfering with outside spikes.

If a rail with a wider base than existing rail is being laid, one rail should be laid from the outside and one from the inside, with the same care in adzing ties so that the wheel will tread the full width of the head of the rail as in laying from the inside. The track should be put to true gauge when rail is laid.

Seventh. When the proper tables for expansions are not given by the mill engineer rolling the new rail (which is sometimes done according to the formula used in making the rails) the tables recommended by the American Railway Engineering Association should be used. This table is herewith given with a slight variation:

20 degrees	5-16"
40 degrees	1-4"
60 degrees	3-16"
80 degrees	1-8"
100 degrees	0

No rail should be laid when temperature falls below zero.

Eighth. A foreman laying rail should be provided with a thermometer to enable him to know at all times what the temperature is and to use expansion shims accordingly and he should also have a steel tapeline to frequently check the positions of his joints and understand the importance of keeping the joints uniformly broken, without which uneven spacing of ties between joints and unsightly and improperly laid track will result.

Ninth. Three or four bolts in a joint, properly tightened up during the day while laying operations are going on, are sufficient to permit traffic to go over, but all joints should be full bolted and bolts made reasonably tight and all spikes driven down before quitting work at night.

Tenth. The practice of using switch points to make temporary connections while laying rail is gradually losing favor and the more safe way of having compromise joints made to fit both sections of rail that are being handled is recommended, having in mind, of course, to do the least cutting of full length rails possible. The foreman should carry forward with him the portions of the first cut rail and, while laying rails longer than the existing rails or where rails run away from the old location of joints, he can always make his closure where a shorter rail will answer until the full rail is used up.

Eleventh. Using the proper expansion between the new rail being laid, which nearly always varies from that being taken out, rails should be laid without regard for holding the joints on the old joint ties and enough rail anchors used to hold it from creeping until ties are spaced and joint ties properly spiked. We also recommend a certain number of rail anchors being used permanently, according to conditions, to assist the joint ties in keeping the rail from creeping, the idea being that in the past too much was expected of the only way we had of holding the rail, viz.: the slots in the flange of angle bars.

Twelfth. Ties should be spaced as soon as possible and all defective ties renewed and track properly surfaced, gauged and lined immediately after rail is laid, all bolts should be tightened to as near the same tension as possible—a most important feature in getting the best results from new rail, as nothing so effectually destroys or nullifies the good work of a foreman, in getting rail laid with the proper expansion, than to have some joints tight and some loose, the heat or cold always pulling the rails apart or closing them up where there is the least resistance. No poor spikes should be redriven.

Thirteenth. In handling relayer rail the same general methods should be used, in addition, care should be taken not to relay any poor rail or worn out joints and the proper place and time to guard against this is when the rail is being removed from track; flaws are easier detected then and the condition of joints more readily seen.

Fourteenth. Rail laid near depots or water stations where trains stop and start will be worn down more than out in the open and this rail should either be kept together or culled out entirely. All good rails from one side should be loaded on same cars and as near in rotation as possible and unloaded the same way so as to be put back in the track as near adjacent to each other as they were taken out.

Fifteenth. Rail should always be laid with the current of traffic when conditions will permit and great care should also be exercised to see that it is properly in place. When a new rail is laid over where an old joint was slightly low, it should be tamped or blocked up to prevent it being surface bent by the first train over it. In fact, there are many details in addition to those set forth in this report that the foreman who is considered capable of handling a rail gang will see to, of his own accord, the organizing of his gang, the rules of flagging, the time of day to run rail in and the amount that can be well and safely laid, can reasonably be left to him and the prime object should be, not how much can be laid, but how much can be well laid and with the least interruption of traffic or anxiety to the officers who are immediately responsible for its proper laying and maintenance and for the results that the higher officials expect from the money expended at his request.

Sixteenth. We submit herewith, for purposes of discussion, an outline of an arrangement of a steel gang of fifty-eight men distributed as follows:

2 men, one flagman in each direction at all times when gang is at work.

2 men, taking up and putting down crossings and handling insulated joints.

1 man, with hand car, handling tools, switch point, rail bender, etc.

4 men pulling spikes.
3 men throwing in old rail.
10 men adzing ties.
12 men lifting in new rail.
2 men barring in new rail.
2 men spiking joints and quarters.
4 men spiking.
1 man adzing ties for new joints.
6 men or more putting on new joints and wrenching.
1 man removing expansion shims.
4 men throwing out old rail.
1 man carrying water.
1 foreman of the gang.
2 assistant foremen.
1 time keeper.

DISCUSSION.

J. P. Corcoran (C. & A.) stated there was economy in transferring rail from main to branch lines before it has been entirely worn out in main line service, the result of this was to decrease the cost of maintenance on both main and branch lines.

Chairman Clough said the most important advantage of laying rail in the spring is that the temperature is more uniform and the rail can be laid with less difficulty from expansion.

There was some discussion as to proper number of rails that should be laid at a time and, although it was considered the best practice to lay rails singly, there were some roads where the density of traffic compelled the track men to move in 100 rails at a time that had been previously bolted together.

Sections 8 and 9 of the report were adopted by the association as read.

Section 10. Some members favored the use of switch points for use during laying of rail at the junction between the old and the new rail. The switch point to be the same section as the new rail. Others were just as positive that the safest and most efficient way was the use of compromise joints between the old and the new rail. The association finally decided to accept this paragraph as information.

Section 11 was adopted as read.

Section 12 brought forth a good deal of discussion as to advisability of respacing ties as soon as rail was laid. Secretary Ryan stated he had recently inspected track on the New York Central, where care is used to secure a supported joint; on the Pennsylvania, where a suspended joint is used; and on the Lehigh Valley, where either method is used, during laying of rail, and found that all this track rode equally well. He therefore suggested that the committee's report be amended to read "ties should be spaced as soon as possible." This was adopted by the association.

Sections 13, 14 and 15 were adopted as read, by the association, although there was a great deal of discussion as to the advisability of laying rail with or against traffic in double track railways.

Section 16 was accepted by the association as information, but was not formally adopted.

PROPER ORGANIZATION AND ECONOMICAL USE OF LABOR AND MATERIAL FOR SAFE MAINTENANCE OF TRACK.

By P. J. McAndrews, C. & N. W. Ry.

Safety and economy in track maintenance is the result of a proper organization, systematically assigned, under the direction of experienced officers.

This being essentially an age of progress with SAFETY and EFFICIENCY the watchwords in all commercial and transportation enterprises, it appears to your committee that for the important work of maintaining track, our railway companies should keep abreast of the times by having their forces organized in a manner that will give the largest possible measure of safe and efficient operation, which results from careful and economical maintenance of roadway and track.

1. OTHER DEPARTMENTS COMPARED. a. We call attention to the fact that in all other departments, additional supervision has been provided as the need became apparent, but on many important railroads we find today practically the same scheme of track organization as existed as much as forty years or more ago. Thus: to supervise the work of such highly intelligent classes of employees as train and enginemen, numerous trainmasters, road foremen of engines, traveling firemen, etc., have been added, while in the signal department we note the addition of many assistant maintainers, foremen and inspectors. The needs of the track department, however, with its constantly lowering grade of laborers, and an increasing demand for safer track has been given little consideration.

b. It is not our purpose to criticize our managements for the employment of many supervising officers to instruct and direct the men employed in other departments, but we maintain that in the interests of the railway companies, the stockholders and the employees the time has arrived for careful consideration of the needs in the track department for such supervision as will guard against waste.

c. True, few railways have fortunately been under the control of managements made up of far seeing men who by anticipating this need have built up track organizations of such efficiency that their lines are known as the exceptionally high class railways of America with standards of excellence, their well known superiority in this respect giving them a prestige which brings much competitive business to their lines, resulting in earnings that assure greater financial success than that reached by other lines, which from choice or necessity have handled their track matters in the old hand to mouth policy.

d. While a few lines have wisely added supervision, there is yet much to be desired on many of our principal railways and we beg to submit the opinions and recommendations of our committee to the association membership, endeavoring to show wherein we believe economies may be brought about that will result in a higher standard of safety and efficiency, without increasing the expenditures for track maintenance.

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h. It is impossible to fully cover within the limited scope of our report the numerous reasons why we believe a change in track organization is necessary on many systems, but we would point out that under the present organization in effect on some lines, where the division superintendent has the division roadmasters or supervisors immediately under him, it is thought that some measure of efficiency is lost because often such superintendent is not familiar with track matters, and especially so during the early years of his experience as superintendent before he has had opportunity to study and absorb some of the essential principles of track maintenance. The reasons for this lack of knowledge on track matters are obvious and naturally result from the early training of such officials being more particularly along other lines, as general engineering, transportation, etc.

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j. No plan of organization can be worked out that would exactly fit conditions on all railways nor perhaps on all divisions of any large system, but we desire to submit here a proposed plan, that, with modifications, might be found suitable for many of the principal lines with heavy or medium traffic.

PROPOSED PLAN OF ORGANIZATION FOR TRACK MAINTENANCE FORCES.

	Divisional.	Sub Divisions.	
General	Div. Supt. or Div. Eng'r. Division or General Roadmaster	Roadmaster or Supervisor	General Foreman
			Extra Gang Foreman
		Roadmaster or Supervisor	Section Foreman
			Student Foreman
		Roadmaster or Supervisor	Laborers

2. TERRITORY—a. General roadmasters should have jurisdiction in the same district as his division superintendent.

b. On heavy divisions roadmasters* should have districts not exceeding fifty (50) miles of double track or one hundred (100) miles of single track, while on lighter divisions through prairie country one hundred twenty-five (125) miles should be the maximum length of district.

With this proposed organization we would recommend that all records be kept and handled at the office of the general roadmaster and that the district roadmasters only conduct such correspondence as may be necessary to direct the work of the foremen, a sufficient force to be employed at the office of general roadmaster to keep necessary accounts, showing expenditure for material and labor with correct distribution thereof to the various prescribed divisions of charges. Through the elimination of office work, the district roadmaster would be in a position to spend the greater portion of his time out on the line among his foremen and laborers, giving the personal supervision and instruction which is essential to efficiency.

*—Roadmaster or Supervisor.

3. DUTIES OF EMPLOYEES.—a. General roadmasters should exercise supervision over his assigned territory, carrying out the policy of the management, distributing to his district roadmasters, necessary material and making such allowances for labor on the various districts as conditions warrant, placing the material and labor to the advantage that his experience should enable him to observe.

b. Necessary general instructions to roadmasters should be issued from his office, proper data for cost records should be secured and worked out to determine the efficiency of those employed under him and a careful survey should be made of conditions on the various roadmasters' districts at frequent intervals.

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5. SUMMARY. Thus, our proposed organization of maintenance forces would work out as follows:

a. The student foremen on each section or on a number of the sections in each roadmaster's district would be serving an apprenticeship, learning the business of maintaining and constructing track, fitting themselves for promotion to the position of foreman when they are able to perform the duties of that position and while they are learning the trade they should get such compensation as will command the services of intelligent and ambitious young men, so that as they advance in the different grades of promotion the standard will be raised.

6. a. Thus far, we have treated only of the organization, in so far as it pertains to supervision, but it is agreed that unless we can raise the standard of track laborers, all our efforts to increase the efficiency of our supervising officials will amount to but little. It has been demonstrated in the past that the best official is one who has come up from the ranks and has learned his business in the school of long hours, hard knocks, and strict compliance with the orders of his superior officers.

b. We believe that in order to compete with other industries in securing laborers, a reasonable rate of compensation should always be paid with an "all year round" program of work for extra gangs as well as section crews, and that the majority of laborers be retained in service continually.

c. It is generally agreed that in the temperate zone, the work of relaying steel may be successfully carried on in winter and this should always be done, thus enabling the division roadmasters to keep his steel gang employed steadily at reasonable wages; which would be a sufficient inducement to retain the best class of laborers. The relaying of side tracks and other yard improvement work can be economically done in winter and we think the retention of extra gangs could be arranged for.

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The practice of all the railways trying to do their year's work in a few months creates an abnormal demand for labor during the short season and makes necessary the payment of much higher wages than would be the case if men were steadily employed and the work spread out over the year.

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General roadmasters with a program of work covering all or nearly all the year would be in a position to give the purchasing department advance notice and get materials in such quantities and at suitable times to avoid accumulation of large stocks.

8. WORK TRAINS.—a. The use of regular assigned work trains is recommended on each general roadmaster's territory and with such work trains a select crew of laborers and competent foreman should be assigned to handle the work of unloading ties, rails, cinders, etc., all the year round.

It is suggested that on important divisions a storekeeper be placed in direct charge of track material and supplies, such storekeeper to render necessary reports to the division or general storekeeper, but to keep such stock on hand as may be directed by the general roadmaster.

b. Stocks of rails, ties, fastenings, etc., should be kept at some central point, (preferably at division headquarters) and a regular distribution should be made to the different section and extra gangs, care being taken to avoid any accumulation beyond a supply to keep the work of repairs and improvements from being delayed.

c. Scraps of all kinds should be regularly gathered up and disposed of as desired, either by shipping to the general storekeeper for marketing or assembling it at a designated point.

DISCUSSION.

The entire report met with general approval, the discussion being devoted principally to the proper length of roadmaster's and section foreman's territory. It was agreed that the recommendations of the committee would bring about improved conditions. The committee's suggestion of the employment of a general roadmaster also met with approval of the association at large.

PROPER TYPE OF TRACK ACCESSORIES.

By M. Donahoe, Chicago & Alton.

When we stop to consider the percentage of increase in weight and size of locomotives and tonnage capacity of cars within the past twenty-five years, also the increased traffic and high rate of speed maintained on the average railway, as against the increased weight of rail and improved track appliances now in use, the latter has lost considerable ground or at least many of the railway have by not availing themselves of the use of some very good types of track accessories now on the market.

We have in mind the manganese steel applied to crossings and other frogs and switch points, the tie plate, rail anchor, guard rail clamps, improved guard rails, automatic switch stands, etc., that have long since demonstrated their usefulness and are not an experiment.

Such roads, without criticism to their management, seemingly give too much consideration to first cost of such appliances without considering results, more safety and a saving by the use of same in time to come. For instance, some roads, whose track carry very heavy traffic and high speed trains, will limit the use of tie plates to curves over a specified degree, and possibly a plate on alternate ties on some of the lesser degree curves; manganese steel crossings are confined to crossings jointly maintained with other railroads, and so on, in the interest of economy, that as a matter of fact more often means increased cost of maintenance.

Perhaps, if the roadmasters and trackmen in general had gotten together twenty or twenty-five years ago as they are today, better and more essential types of track accessories might be in use more extensively than they are at present.

It is strange, but nevertheless true, that the practical trackman seldom ever produces an improved type of track appliance, presumably because he sees quickly all the disadvantages of an idea he may have in mind and discontinues further thought on the matter, while the non-practical man or someone not at all familiar with track maintenance will get up some device that, in time, will prove to be a good, useful article. It seems to be more of the trackman's duty to try out and recommend the merits of the other fellow's device or invention. He reports on the good and bad features of the device until it is improved upon—more often upon the trackman's suggestion—until it is finally made to meet the requirements, and is a success.

We believe that the average, present-day roadmaster does not recommend and advocate to his superior officers the needs and advantages of using more, better, and improved track appliances as he should, with a view of reducing the cost of maintenance in both material and labor.

Locomotive works and mechanical departments have advanced far beyond that of the maintenance department during the past twenty-five years and there seems to be no more reason for some railways to keep in service, old types of switch stands, frogs, and other devices that have been in use twenty-five years, and no more economy in so doing, than there would be for locomotive builders to keep on using the old crosshead pump and tallow pot instead of adopting the present-day injector and lubricator.

RAIL-JOINTS.

The first angle bar joint of which we have known was brought into service during the year 1868. Previous to this angle bar the joint was the fish-plate, head-chair, etc.

The requirement of a perfect joint is to connect the rail ends into an almost uniform and continuous girder. It must be strong enough to resist deflection or taking permanent set, remain tight, consistent with permitting rail to expand, be simple, with as few parts as possible, and withstand damage by derailed wheels.

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We do not hesitate to recommend a plain, four-hole angle bar joint, twenty-four inches long, with sufficient weight and proper distribution of metal, in accordance with the rail section it is applied to, to best resist deflection. The bolts for 90-lb. rail section should be one inch in diameter, U. S. standard thread, with a good make of spring nut lock and lock nut square head tap, staggered in joint. Where traffic is very dense and heavy we recommend a separate plate to be applied. This base plate should be about ⅝ inch thick, as wide as the angle bar to be used with, turned up at ends of angle bar, and might also have a longitudinal rib under center of plate to act as a strengthener or truss for

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d. While a few lines have wisely added supervision, there is yet much to be desired on many of our principal railways and we beg to submit the opinions and recommendations of our committee to the association membership, endeavoring to show wherein we believe economies may be brought about that will result in a higher standard of safety and efficiency, without increasing the expenditures for track maintenance.

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h. It is impossible to fully cover within the limited scope of our report the numerous reasons why we believe a change in track organization is necessary on many systems, but we would point out that under the present organization in effect on some lines, where the division superintendent has the division roadmasters or supervisors immediately under him, it is thought that some measure of efficiency is lost because often such superintendent is not familiar with track matters, and especially so during the early years of his experience as superintendent before he has had opportunity to study and absorb some of the essential principles of track maintenance. The reasons for this lack of knowledge on track matters are obvious and naturally result from the early training of such officials being more particularly along other lines, as general engineering, transportation, etc.

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j. No plan of organization can be worked out that would exactly fit conditions on all railways nor perhaps on all divisions of any large system, but we desire to submit here a proposed plan, that, with modifications, might be found suitable for many of the principal lines with heavy or medium traffic.

PROPOSED PLAN OF ORGANIZATION FOR TRACK MAINTENANCE FORCES.

	Divisional.	Sub Divisions.	
General	Div. Supt. or Div. Eng'r. Division or General Roadmaster	Roadmaster or Supervisor	General Foreman
			Extra Gang Foreman
		Roadmaster or Supervisor	Section Foreman
			Student Foreman
		Roadmaster or Supervisor	Laborers

2. TERRITORY—a. General roadmasters should have jurisdiction in the same district as his division superintendent.

b. On heavy divisions roadmasters* should have districts not exceeding fifty (50) miles of double track or one hundred (100) miles of single track, while on lighter divisions through prairie country one hundred twenty-five (125) miles should be the maximum length of district.

With this proposed organization we would recommend that all records be kept and handled at the office of the general roadmaster and that the district roadmasters only conduct such correspondence as may be necessary to direct the work of the foremen, a sufficient force to be employed at the office of general roadmaster to keep necessary accounts, showing expenditure for material and labor with correct distribution thereof to the various prescribed divisions of charges. Through the elimination of office work, the district roadmaster would be in a position to spend the greater portion of his time out on the line among his foremen and laborers, giving the personal supervision and instruction which is essential to efficiency.

*—Roadmaster or Supervisor.

3. DUTIES OF EMPLOYEES.—a. General roadmasters should exercise supervision over his assigned territory, carrying out the policy of the management, distributing to his district roadmasters, necessary material and making such allowances for labor on the various districts as conditions warrant, placing the material and labor to the advantage that his experience should enable him to observe.

b. Necessary general instructions to roadmasters should be issued from his office, proper data for cost records should be secured and worked out to determine the efficiency of those employed under him and a careful survey should be made of conditions on the various roadmasters' districts at frequent intervals.

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5. SUMMARY. Thus, our proposed organization of maintenance forces would work out as follows:

a. The student foremen on each section or on a number of the sections in each roadmaster's district would be serving an apprenticeship, learning the business of maintaining and constructing track, fitting themselves for promotion to the position of foreman when they are able to perform the duties of that position and while they are learning the trade they should get such compensation as will command the services of intelligent and ambitious young men, so that as they advance in the different grades of promotion the standard will be raised.

6. a. Thus far, we have treated only of the organization, in so far as it pertains to supervision, but it is agreed that unless we can raise the standard of track laborers, all our efforts to increase the efficiency of our supervising officials will amount to but little. It has been demonstrated in the past that the best official is one who has come up from the ranks and has learned his business in the school of long hours, hard knocks, and strict compliance with the orders of his superior officers.

b. We believe that in order to compete with other industries in securing laborers, a reasonable rate of compensation should always be paid with an "all year round" program of work for extra gangs as well as section crews, and that the majority of laborers be retained in service continually.

c. It is generally agreed that in the temperate zone, the work of relaying steel may be successfully carried on in winter and this should always be done, thus enabling the division roadmasters to keep his steel gang employed steadily at reasonable wages; which would be a sufficient inducement to retain the best class of laborers. The relaying of side tracks and other yard improvement work can be economically done in winter and we think the retention of extra gangs could be arranged for.

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The practice of all the railways trying to do their year's work in a few months creates an abnormal demand for labor during the short season and makes necessary the payment of much higher wages than would be the case if men were steadily employed and the work spread out over the year.

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General roadmasters with a program of work covering all or nearly all the year would be in a position to give the purchasing department advance notice and get materials in such quantities and at suitable times to avoid accumulation of large stocks.

8. WORK TRAINS.—a. The use of regular assigned work trains is recommended on each general roadmaster's territory and with such work trains a select crew of laborers and competent foreman should be assigned to handle the work of unloading ties, rails, cinders, etc., all the year round.

It is suggested that on important divisions a storekeeper be placed in direct charge of track material and supplies, such storekeeper to render necessary reports to the division or general storekeeper, but to keep such stock on hand as may be directed by the general roadmaster.

b. Stocks of rails, ties, fastenings, etc., should be kept at some central point, (preferably at division headquarters) and a regular distribution should be made to the different section and extra gangs, care being taken to avoid any accumulation beyond a supply to keep the work of repairs and improvements from being delayed.

c. Scraps of all kinds should be regularly gathered up and disposed of as desired, either by shipping to the general storekeeper for marketing or assembling it at a designated point.

DISCUSSION.

The entire report met with general approval, the discussion being devoted principally to the proper length of roadmaster's and section foreman's territory. It was agreed that the recommendations of the committee would bring about improved conditions. The committee's suggestion of the employment of a general roadmaster also met with approval of the association at large.

PROPER TYPE OF TRACK ACCESSORIES.

By M. Donahoe, Chicago & Alton.

When we stop to consider the percentage of increase in weight and size of locomotives and tonnage capacity of cars within the past twenty-five years, also the increased traffic and high rate of speed maintained on the average railway, as against the increased weight of rail and improved track appliances now in use, the latter has lost considerable ground or at least many of the railway have by not availing themselves of the use of some very good types of track accessories now on the market.

We have in mind the manganese steel applied to crossings and other frogs and switch points, the tie plate, rail anchor, guard rail clamps, improved guard rails, automatic switch stands, etc., that have long since demonstrated their usefulness and are not an experiment.

Such roads, without criticism to their management, seemingly give too much consideration to first cost of such appliances without considering results, more safety and a saving by the use of same in time to come. For instance, some roads, whose track carry very heavy traffic and high speed trains, will limit the use of tie plates to curves over a specified degree, and possibly a plate on alternate ties on some of the lesser degree curves; manganese steel crossings are confined to crossings jointly maintained with other railroads, and so on, in the interest of economy, that as a matter of fact more often means increased cost of maintenance.

Perhaps, if the roadmasters and trackmen in general had gotten together twenty or twenty-five years ago as they are today, better and more essential types of track accessories might be in use more extensively than they are at present.

It is strange, but nevertheless true, that the practical trackman seldom ever produces an improved type of track appliance, presumably because he sees quickly all the disadvantages of an idea he may have in mind and discontinues further thought on the matter, while the non-practical man or someone not at all familiar with track maintenance will get up some device that, in time, will prove to be a good, useful article. It seems to be more of the trackman's duty to try out and recommend the merits of the other fellow's device or invention. He reports on the good and bad features of the device until it is improved upon—more often upon the trackman's suggestion—until it is finally made to meet the requirements, and is a success.

We believe that the average, present-day roadmaster does not recommend and advocate to his superior officers the needs and advantages of using more, better, and improved track appliances as he should, with a view of reducing the cost of maintenance in both material and labor.

Locomotive works and mechanical departments have advanced far beyond that of the maintenance department during the past twenty-five years and there seems to be no more reason for some railways to keep in service, old types of switch stands, frogs, and other devices that have been in use twenty-five years, and no more economy in so doing, than there would be for locomotive builders to keep on using the old crosshead pump and tallow pot instead of adopting the present-day injector and lubricator.

RAIL-JOINTS.

The first angle bar joint of which we have known was brought into service during the year 1868. Previous to this angle bar the joint was the fish-plate, head-chair, etc.

The requirement of a perfect joint is to connect the rail ends into an almost uniform and continuous girder. It must be strong enough to resist deflection or taking permanent set, remain tight, consistent with permitting rail to expand, be simple, with as few parts as possible, and withstand damage by derailed wheels.

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We do not hesitate to recommend a plain, four-hole angle bar joint, twenty-four inches long, with sufficient weight and proper distribution of metal, in accordance with the rail section it is applied to, to best resist deflection. The bolts for 90-lb. rail section should be one inch in diameter, U. S. standard thread, with a good make of spring nut lock and lock nut square head tap, staggered in joint. Where traffic is very dense and heavy we recommend a separate plate to be applied. This base plate should be about ⅜ inch thick, as wide as the angle bar to be used with, turned up at ends of angle bar, and might also have a longitudinal rib under center of plate to act as a strengthener or truss for

additional support under rail ends. The base plate eliminates the expense of joint tie plates, supports the base of rails where they rest on the ties, provides a truss member which practically makes the joint as strong as the unbroken rail so that the spikes cannot be sheared off in the slots of angle bars by creeping rail. The additional cost of base plates can be eliminated by not using the base plates where the traffic is light and does not require it.

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SWITCHES AND MANGANESE SEPARABLE POINTS.

2. (a) For split switches in common use we recommend the reinforced point with length and planing in accordance with the length of lead or angle of frog it is commonly used with.

(b) For plates we recommend a ⅝ inch by 6 inch or 6½ inch gauge plate about 6 inches long—insulated where necessary—turned up at each end to form a shoulder, for a rail brace to fit between this shoulder and the rail. The slide plates should be of iron, 9-16 inch by 6 inches, 12 inches long for plain plate and 20 inches long for brace with a riser three to four inches in width, rolled or planed, to the plate, with the outer ends of plate turned up to form a shoulder for a brace to be applied against. This brace should be a separate part of the plate punched and fitted to spike through the brace and plate. These plates and braces should be on every tie from the gauge plate at switch point to heel of switch, every other plate to be plain, and with a brace attached. Special tie plates without braces should be used commencing with the joint tie at heel of switch and extending some four ties from the heel of switch to a point where the regular tie plates can be applied. These long special plates should be properly spike-punched for the road's standard turn-outs, the spike-punching for turn-out rail be made large enough to care for a ⅝ inch variation in line.

(c) For a heel joint, we recommend a 20 inch cast heel block filler made to fit snugly between the joint and traffic rail, bolted through the block filler and joint to an angle bar on the gauge side of point independent of the traffic rail. The bolt heads should be countersunk in the cast filler block so the latter will set up snug against the traffic rail, answer for a foot guard and be free from creeping of traffic rail on one-way traffic.

(d) Spread bars, two in number, should be flat rods connected with a transit clip riveted to the switch point. The transit clip has five bolt holes to provide for the adjustment of the switch. The connecting rods and spread bar are connected with a pin and cotter protruding downward, the same as used in interlocking connections. Two stop brackets are made of one-half, two and one-half, and three inch iron, riveted to switch point between end of planing and heel of point to prevent spread of switch point against stock rail.

(e) For yard use, inside switches, where work is heavy, we recommend the manganese separable switch point. The cutting or sawing off the section of worn point and applying the manganese section of point should be done at terminal roundhouses where there is a blacksmith employed and at local shops when they are not too far distant. The stock rail supporting the turn-out point in switching yards and at all inside switches should have the double kink to protect the switch point from excessive wear and prevent the switch from being split by a wheel flange on account of a loose-fitting switch point. For railways that have frog repairing equipment with a rail planing machine, we recommend cutting off the worn end of old switch points and planing them back to shorter lengths. For instance, an 18-ft. switch point can be cut off to 16½ or 15 ft. and planed off to a standard 15 or 16½ ft. point with spread bar lugs reset accordingly. A worn 15-ft. point can be cut back and planed to a 12 ft. for yard use.

(f) Few roads have 18-ft. switches but the average road has 16½ ft. switches for a standard in main track so that, when worn at the point, they can be cut off and planed to a 12-ft. or 15-ft. point for yard use. We do not recommend a switch point shorter than 12-ft. because the space of wheel tread between rear drivers or trailer wheels and forward tank truck wheels of engines being less than 12-ft., will cause a shorter point, when cut or worn down in the ties at heel joint, to act as a fulcrum, due to the weight of a wheel passing over heel joint, causing the point to lift upwards and gap open at the time the next pair of wheels are approaching it and thus making possible the splitting of the switch.

FROGS (CROSSING AND OTHERS).

3. (a) Your committee recommends the solid manganese frog for crossings except where the traffic is light and the wear in either direction only moderate. In frogs where the inserted manganese filler is used, the common steel rail should join onto the manganese with a square cut end, and in such a manner that the track-men can renew the section of common rail should it become necessary; whereas, if the common rail joined onto the manganese with a mitre cut end or such like, it would be very difficult, or almost impossible for the track-men to change it.

(b) We also recommend solid manganese rigid frogs in all terminals on busy switching leads and where the Bessemer or open hearth rail would wear out in less than one year. The saving of labor as well as the interruption of track should be considered and reduced as much as possible, and we feel that the introduction of solid manganese frogs at all points where the traffic is heavy, would greatly cut down expenses and be of great benefit to the non-interruption of traffic.

(c) Manganese crossings for steam railroads, depending upon the angle, should be made up in two or four sections. A one-piece crossing cannot be free from strains that a two or four piece crossing overcomes. Besides, there is no doubt of difficulties encountered from a foundry standpoint in manufacturing the one piece crossing. We know of instances where manganese track work in crossings and frogs had failed in service short of the time allotted, or before rendering the service which its purchaser had a right to expect of it. These failures were due to various causes, such as cracks in the base of groove at intersection of crossing frogs, which have since been practically eliminated by better methods of reinforcing, and the proper distribution of metal underneath the point of intersection which is the most vital spot in a crossing, necessarily so on account of the terrific hammering to which it is subjected when a heavy train passes over the crossing at a high rate of speed.

(d) The outside arms of all manganese crossings should be made as short as possible for better service as well as saving in material. The solid manganese crossing is a rigid affair, the casting itself must be bent back and forth under traffic, there being no opportunity for the various short sections to work and stretch at the joints as would be the case with a crossing built up of short sections. Therefore, the outside arms should be kept short. All outside arms should be provided with an easier rail extension and "U" section of crossing made to offset, and join to the section of common rail abutting the crossing with as neat and rigid a fit as possible.

(e) We believe that the earnest co-operation of the maintenance of way departments of the railroads, the builders of track work, and the foundries that produce the manganese steel castings, has developed and perfected a better quality of manganese steel castings, more dense and free from imperfections, superior in design and better installed in track with better maintenance after installation.

(f) For rigid frogs constructed of planed "T" rail, we recommend the cast filler bolted frog with spring nut lock and square head lock nut, bolts to be of Mayaria heat treated, for all frogs and crossings. Rigid frogs of a flat angle for use right and left hand, should have the short point on turnout side of frog, turnout rail at toe of frog to be enough longer than the lead rail, or tangent rail of frog, in order to square the switch points at head block when enclosure rails of same length are used between frog and switch.

(g) Spring rail frogs should have tie plates attached, in accordance with proper tie spacing, to support dimensions of frog, except under joint ties, at heel and toe of frog, where special make of detached plates should be used, slot punched to mate with gain holes in angle bar joints. An anti-creeper device should be used about midway between throat and joint at toe of frog.

The rail for a sufficient distance back of all spring rail frogs, on one-way traffic, should be securely anchored with anti-rail creepers to prevent rail from crowding the frog, or wing rail of frog, as this is the difficulty we have with spring rail frogs on one-way traffic track.

(h) We recommend that the design of spring rail frogs be made such that wing rail can be readily removed to change frog bolts.

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SWITCH STANDS.

4. (a) Your committee recommends the automatic switch stand for use on main line switches, about yards and terminals, where the switch is subject to being run through, as well as to operate all busy yard or inside switches, hand-throw. The recommendation for use of automatic switch stands on main line switches subject to being run through has been well considered and the use of the up-to-date, automatic switch stand is perfectly safe and proper on a main line switch.

(b) By automatic, we mean a stand that, when trailed through by an engine or cars contrary to the track the switch is set for, it will permit a complete throw and leave the switch latched or locked for the track which the car or engine had used in trailing through the switch and leave the target set at "Stop" or to indicate the track or position the switch is set for after being run through.

(c) There is considerable argument against this type of stand, based on experience with old makes. Many of us have had experience with the old ones and probably have had some trouble with them due to the design and construction of the old make of automatic stand. The principle was all right and, long since, this type of automatic stand has become improved upon by study and attention to such an extent that we have now on the market modern types of automatic stands meeting all the requirements for safety, simplicity and durability.

(d) Some of the arguments against automatic switch stands for main line use is that they are not safe. The improved, up-to-date automatic stand is absolutely safe as any piece of mechanism that may be performing just as important, or possibly more important functions in the safe operation of a railroad. Another argument against the automatic stand is that dragging equipment (a chain, rod or such like) trailing a switch with automatic stand is liable to become wedged or pull through between the switch point and stock rail, leaving the switch point gapped open. The foot block or cast heel joint filler we have at heel of split switches in most cases should deflect such an obstruction from wedging against the switch point. If such a condition should happen with a rigid stand operating the switch there would be a broken or bent point or connection leaving an open or loose-fitting point; whereas if an automatic stand were operating the switch it would spring back to position after the obstruction pulled through the point, or, at least, the wheel tread would throw the switch back to position.

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(h) As to targets, we recommend the semaphore arm blade, two of such blades bolted to the shaft or mast of stand, one at an angle of forty-five degrees downward, indicating "Proceed" or switch set for main line, the other arm to set at an angle of ninety degrees, indicating "Stop," or switch set for siding. The quarter turn of shaft, in accordance with the throw of switch, would change the position of semaphore arms. These arms can be of enameled metal or wood and of two sizes. A large blade, standard size, for high masts and small blades for medium height or eight-foot masts; the lamps to set on end of mast or shaft in whatever means the road's switch lamp seat is made for. For any railway anticipating changing their standard of switch target or banner, we would recommend this kind, as it is not much, if any, more expensive than the ordinary target or banner while, of course, it is the proper semaphore arm design.

GUARD RAILS AND FASTENINGS.

5. (a) Frog guard rails and fastenings are a very essential device to prevent derailments by wheel flanges mounting or taking the wrong side of frog point facing the switch. There are three important features in connection with the construction, and maintenance of guard rails: after the length, shape or design is decided on a good secure fastening must be provided. There are in use accessory parts which go to make guard rails stable and secure, some of which are filler blocks and bolts, guard rail clamps, tie plates and braces, the application of which are equally important as the guard rail itself. The most of the guard rails in use vary in length from six to fifteen feet, and are very generally made of the same pattern of rail as that used in the track.

(b) The ends of guard rail are to be bolted through a cast filler to the traffic rail with one large size bolt, (1 in. for a 90-lb. rail). This cast filler is to serve as a foot guard as well as to help hold the guard rail secure. A good make of guard rail clamp is to be applied at center of guard rail or opposite throat of frog. Tie plates should reach under both guard rail and traffic rail, slotted for spiking on outer side of traffic and guard rail. The guard rail should be planed on inner side sufficiently to permit it setting up to the proper clearance for flangeway. It will not be necessary to leave space for spiking between the guard rail and the traffic rail. In placing this style of guard rail, set the center of the guard rail opposite or at right angles to the throat of the frog, or just ahead of the theoretical point of the frog. The ends are to be planed off so as to be protected against direct impact with moving parts of equipment. The same applies to ends of wing rails on frogs. The two-foot inward curve at end of guard rail is to avert an abrupt blow from wheel flange in passing through the frog and guard rail.

(c) There are several makes of guard rail clamps. Some are very good when made to properly fit the rail, and the filler blocks or wedges are so designed as to remain in place after being set and the guard rail properly adjusted. We find that the wedge and fillers in some makes of guard rail clamps become loose and shift out of place leaving the clamp practically worthless.

(d) There are also some improved guard rails which are more secure and perhaps require less attention after once being applied than the design of guard rail recommended but such improved guard rails are more expensive on account of being constructed of new material out and out and such expense may hinder some roads from adopting them other than a small percentage for use where the wear on guard rails is very severe. We have in mind the one piece manganese steel guard rail.

TIE PLATES.

6. (a) The tie plate first came into use for the protection of the tie and its main purpose so remains, although it has become a factor in preventing spread track as well as mechanical wear to the tie, since the tonnage and weight of power has been so greatly increased. Some of the first plates with deep flanges and ribs were found to be injurious to the tie by cutting too deep into the fibre. The modern type of tie plate in use has a smoother bottom, or with but little corrugation, possibly a shallow, transverse rib with a shoulder to resist the lateral thrust of the wheel flange and hold the track to gauge.

(b) The committee recommends a plate that will extend 3½ in. outside of the base of rail and 1½ in. in the inside. The plate should be the width of the standard tie in use and should be at least ½ in. thick.

(c) Tie plates should be used on all curves, on all soft wood ties on tangents as well as on curves, and on all ties of tangent track where traffic is heavy.

ANTI-RAIL CREEPERS.

7. (a) Anti-rail creepers have become a necessity on modern railways and their use more and more apparent with the increased weight of motive power on double track territories where the current of traffic is in one direction, heavy tonnage movement, fast trains and light gravel ballast.

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NICKEL CHROME STEEL FROG, CROSSING AND TRACK BOLTS.

8. (a) The ordinary carbon steel bolt applied to crossings and frogs are not necessarily efficient and require more or less renewals on account of breaking under strain of the wrench or after being

sufficiently tightened, particularly where the crossing and frogs are worn so as to spread under load.

(b) The Mayari, nickel chrome, heat treated bolts serve to overcome such defects and withstand the strain and elastic limit of a trackman's wrench as well as prevent spread of rail, and cast fillers under load permitting the whole structure from becoming loose or working, and thereby increasing the wear. This bolt will withstand bending cold without fracture.

(c) One of the bad features of maintaining a loose-bolted crossing or frog in one-way traffic is that the rail creeps through the crossing or frog, causing the common bolt to bend and break. The efficiency of the Mayari bolt will far more than pay for the difference in price. The labor saving in renewing common bolts is eliminated by the use of the Mayari steel bolt as well as the material charge. The price of the Mayari heat treated bolt is approximately $4.00 per hundred pounds, or about forty per cent higher than the common crossing bolt.

(d) The physical properties of these bolts are:

Elastic limit not less than 75,000 pounds.

Ultimate strength not less than 100,000 lbs. per sq. in.

Will bend double without fracture.

Whereas the common bolt has a tensile strength from 45,000 to 60,000 lbs.

Elastic limit is from 16,000 to 35,000 lbs. per sq. in.

(e) We are informed that track bolts of this material are made a standard on the Delaware, Lackawanna & Western R. R., Central R. R. of N. J., Philadelphia & Reading R. R., Chicago & Great Northern R. R., and are used on the L. S. & M. S., Metropolitan Street Ry. of Kansas City, San Diego Electric Ry., Bay State Ry., Pennsylvania R. R. and the New York, New Haven & Hartford, and many other important steam and street railways.

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"FRICTIONLESS RAIL."

FRICTIONLESS RAIL—THE ACTION OF WHEELS ON CURVES LAID WITH

10. When a car truck with wheel rigidly mounted on axles is moved around a curve, the inside wheel of each axle tends to travel as great a distance on the track as the outside wheel. Since the outside rail of the curve is obviously longer than the inside rail, between points of tangent, one wheel on each axle must slip on the rail head.

This tendency of the inside wheel to travel as great a distance as the outside wheel, throws the front axle of the truck at an angle with the radius of the curve ordinarily. The outside wheel flange striking the gauge side of the head of the outside rail corrects this tendency in proportion to the extent to which it can overcome the resistance offered by the adhesion of the wheel treads to the rails. This resistance is evidently greater at the inside rail because of the indication of metal which usually flows over on the heads of the inside rail away from the gauge line.

Centrifugal force tends to keep the outside wheels against the outside rail, but is counteracted by the super-elevation of rail. The element which has received the least attention is the necessary slip of one wheel on each axle. There is no practical method of providing for the slip on the axle. Differential gears on the axles would compensate for this slip, but have been found impractical on railroad equipment. The next apparent solution lies in the rails. As an example we will consider a curve of standard gauge on which car trucks make one-quarter turn between points of tangent. By calculation we find that the outside wheel of each axle in making this quarter turn passes over 7.389 feet more of rail than does the inside wheel. Consequently either the outside wheel must lose over seven feet by sliding while the inside wheel holds the rail, or the inside wheel must gain over seven feet by spinning while the outside wheel holds the rail; or, finally, the slip may be divided between the two wheels, according to which one temporarily has the least adhesion.

A proportionate slip or spin occurs also in the width of the tire of each wheel in contact with each rail. It is figured that wheels having a line of contact 2¼ inches long, as with an 80-lb. rail head, will have a slip or spin of 3.53 inches on the rail heads with which they are in contact, when making a quarter turn. This same amount of slip or spin occurs, of course, on both wheels of each axle, and is, in addition to the 7.389 feet slip or spin first mentioned, which occurs at the respective gauge lines of the wheels and rails.

It is obvious that using a narrow rail head will give a shorter line contact between wheel and rail, and will, therefore, reduce the length of this slip or spin between the narrow rail head and wheel proportionately. With a narrow head as designed for a companion rail for the 80-lb. standard A. S. C. E. rail, with an estimated line contact of wheel and rail of $1\frac{5}{8}$ inches, this slip or spin when rounding a quarter turn will be 2.08 inches, instead of 3.53 inches as with a standard rail having 2¼ inches estimated line contact with a wheel.

The effect of length of line contact in resisting this form of a slip may be easily demonstrated by attempting to turn one's body a quarter turn when the heel and toe of shoe are both kept in contact with the floor, and then making the same attempt when concentrating the weight on either heel or toe of shoe.

There is a further resistance to the movement of each wheel of a truck when rounding a curve, due primarily to the fact that the center lines of the truck axles do not coincide with the radii of the curve. It is obvious that when a truck is on a curve, the axles of the truck being held parallel, the lines of contact of wheels and rails will not be at right angles to gauge line of rail. This angularity will vary with the radius of the curve and distance between axles of each truck, and will somewhat increase the length of line contact between wheel and rail, furthermore will tend to divert the path of the wheels from lines parallel with gauge line of rail. This diversion of the wheel will be checked by the flange of wheels coming in contact with the gauge line of rail. The resistance encountered on this spiral path described by the contact line of wheel when traversing a curve is proportional to the coefficient of friction between wheel and rail.

From the foregoing we find that the narrow rail head is of service in reducing the resistance of the "local" slip on rail heads due to width of rail.

The frictionless rail having thus reduced the resistance to slipping of the inside wheels on the rail of a curve below that of the outside wheels on their rail, it is certain that all the 7.389 feet slip or spin will occur on the inside rail.

This concentration of all the slip on one wheel on each axle explains the remarkably smooth and easy way in which the trucks round short radius curves which are fitted with the narrow head rail on the inside. This comparatively free slipping of the inside wheel on the narrow rail head eases the movement of trucks around the curve in the same manner as applying grease to the top of a standard rail head eases the movement of trucks on curves.

As the adhesion or friction of the inside wheel on the head of a rail forces the outside wheel flange against the gauge line of outside rail, it follows that reducing the friction or adhesion of the inside wheel by the use of a narrow headed rail will reduce this pressure of outside wheel flange against its rail, and consequently will reduce the power necessary to move the truck through the curve.

. From the above we see the function of the narrow head, or "Frictionless" rail, is to concentrate the slip of the wheels on the inside of the curve.

The "Frictionless" rail is laid to customary gauge in track according to standard practice of the road. The outside rail is elevated as usual.

A study of ordinary standard sections of rail which have been in use and worn on curves, will demonstrate what the resistance to slip amounts to. The metal on the top of the head of the inside rail is flowed over, and the tread surface widened appreciably. This increases the line contact between the inside wheel and rail, and aggravates conditions which hardly allow necessary slip at the beginning. The inside wheel tends to become the dominant wheel rather than the outside one, and in consequence the outside wheel is held firmly against the outside rail to the extent of cutting it in many cases. The use of "Frictionless" rail will obviously overcome this trouble.

All of us have at some time, and perhaps often times, changed outside curve worn rail from outer side of curves, where the ball was worn off on gauge side, and narrowed down nearly 1½" in width, and used it on the inner side of curve in yards and on slow movement track, also on turnouts, and you may have noticed that the outer rails stood the wear longer than it had with the full width ball rail on inner side of curve, and if check was taken on the wear of curve worn inner rail I believe it wears as long and perhaps longer than the full width ball rail.

(a) We are not recommending the frictionless rail for general use at this time as it means the rolling of a special rail section of a hard wearing surface on the narrow ball, and it may increase the wear on wheel base to a considerable extent.

(b) We do recommend, however, that curve worn rail from outer side of curve, with ball of rail reduced in width to a narrow section be transferred to inner side of curves, through yards when speed of trains is moderate, as well as for curves for switching movements and on turnouts.

DISCUSSION.

There was quite a dissension of opinion as to the advisability of recommending the use of base plates under rail joints. The association finally decided to receive the section on rail joints as information.

There was discussion concerning the recommendation of the hold-down devices in the spring rails of frogs, principally by B. C. Dougherty (C. M. & St. P.) and T. F. Donahue (B. & O.) To meet the objections the report of the design of frogs was amended to read as shown in text section (h).

The recommendation of the adoption of automatic switch stands brought out a great deal of discussion and many objections. Some stating there were railways that forbade the use of automatic stands on main track, others using them exclusively, notably B. F. Brown of the B. & M., uses them on his subdivision main line switches. A great many thought they were a good precaution to be used in yard switches to save points from being run through by carelessness, but stated they did not believe it was good practice to allow them to take care of the habitual trailing through of switches in order to save the yardmen time and trouble.

W. Shea (C. M. & S. P.) objected to the recommendation of the committee that guard rails should be bolted or clamped to the main track rails. When such bolts or clamps are used he has found that they will loose the spikes holding the main rail, resulting in derailments. He pointed out the necessity for a better device and advocated as one solution, a guard rail independent of the running rail. T. F. Donahue (B. & O.) places heavy tie plates under the guard rails and running rails and applies from two to five rail braces to each guard rail. M. Donahoe (C. & A.) preferred short guard rails, believing that a length of over 10 ft. was detrimental and that the shorter length was sufficient to guard the point.

The recommendations for size of the plates were vigorously objected to and after a lengthy discussion it was decided to change the recommendations to those shown in the text of section (b).

At this point in the proceedings the newly elected officers for the ensuing year were installed. These are: President, P. J. McAndrews, C. & N. W., Belle Plaine, Ia.; first-vice president, Coleman King (Long Island), Jamaica, N. Y.; second vice-president, M. Burke, C. M. & St. P., Chicago; secretary-treasurer, L. C. Ryan, C. & N. W., Sterling, Ill.; member of the executive committee for the full term of three years, W. H. Kofmehl, C. M. & St. P., Elgin, Ill.; A. Grills, Grand Trunk, St. Thomas, Ont., was elected to fill the vacancy on the executive committee occasioned by the election of P. J. McAndrews to the presidency.

With President McAndrews in the chair the last report of the session was read and discussed.

CLEARING AND POLICING THE RIGHT OF WAY FROM THE STANDPOINT OF SAFETY AND ECONOMY.

By J. P. Corcoran, Chicago & Alton.

1. (a) In the middle west the right of way should be mowed of weeds and grass as soon after July 1st as possible, or as soon before as weeds demand it, to prevent fires from spreading into wheat, oat and hay fields, which annually cause heavy losses to the railways. Where the ground is level, the right of way should be cut with a mower and team, paying from $8 to $10 per mile.

(b) For cleaning the right of way: As soon as the weeds and grass are dry the section men should go over the ground and burn off the right of way, either by placing a piece of waste at the end of a wire and drawing it over the right of way cut, or by using a 2-in. pipe, 8 or 10 ft. long, filled with waste and soaked in kerosene oil. This pipe has very small holes bored in it to allow fire to work from the oil in the waste. In burning of right of way great care should be exercised by the section foreman to do the work when the wind is blowing from the field, to prevent the fire from getting away from the section gangs. Every vestige of old wood, trees and other rubbish should be burned while cleaning the right of way.

RAIL.

2. New or relay rail, when unloaded, should be properly distributed and not scattered along the right of way on the ends of ties or down in ditches but should be set off the ends of ties onto the ballast. As soon as the new rail is laid the old rail should be unbolted and loaded as soon as possible to be taken to headquarters or to points where it is to be used. Every vestige of scrap, such as old bolts, spikes, short pieces of rail, old frogs and switches, should be picked up by the rail loader and the right of way should be left clean. It is much cheaper to load rail with a rail loader than by hand with section labor and at the same time injury to laborers is avoided.

3. (a) Ties unloaded in the fall and winter for next season's work should be piled in piles of fifty ties, the piles set at certain distances, so that section forces will not have too long a haul in distributing them for spring work. These ties should be set up out of ditches on high ground so spring freshets will not wash them into openings of bridges and block up the water, thus causing it to go over track.

(b) All treated ties should be covered with two inches of dirt to prevent them catching fire, and weeds and grass should be cleaned away from each pile of ties to prevent fire and give it a tidy appearance.

(c) When ties are distributed to place in track on outlying sections they should be set outside of double track and not between main track as this might invite boys or some mischievous person to place ties on main track.

(d) Ties used in yard should be distributed as used, and old ties removed from track should be picked up each night and not allowed to remain between tracks to cause some switchman or trainmen to become injured.

(e) Ties removed from tracks in cuts should be hauled out of cut to burn them; if burned in cut the dirt is likely to wash down and fill in the ditch. Foremen should be working close to the spots where ties are burning to prevent the fire spreading to adjoining fields and also to see that all ends of ties are properly consumed.

SCRAP.

4. All track scrap, such as old spikes, bolts, splices, rail and frogs, should be picked up at the close of each day's work and taken to the scrap pile. Crooked or bent spikes should be sorted out and set in tool house and on rainy days the section gang can straighten them and use them in side tracks. Old bolts picked up should be sorted over and bolts found fit to use in side tracks should be oiled and nuts placed on them, so that, when wanted, they will be ready for use.

Scrap left lying along track and right of way is not only dangerous on account of children and others picking up same and placing on rail, causing derailments and loss of life and property, but also because large pieces of scrap, left lying close to track, are liable to cause the injury of some employee. Common sense should certainly cause our foremen and men to stop daily as they pass over their sections and pick up this scrap and take it to their headquarters. It is dangerous if left lying around tracks; it is worth something if taken to headquarters and loaded on the

monthly scrap car as it passes over the division. Scrap spikes, bolts and nuts are worth about $18 per ton and your division gets credit for it. Show me a foreman that exercises his good judgment by keeping all scrap on his section picked up currently, and I will point you out a good, loyal employee and a good foreman.

DITCHES.

5. (a) Section forces should watch their ditches and waterways very closely and keep them cleaned out and opened. My first recollection of a general manager addressing a roadmaster on what was the most important factor to good track, and his reply was "Drainage." General manager asked what was the next factor. His reply was "More drainage," and he asked the third factor, and his reply was "More drainage." He wanted to impress the fact that without proper drainage, no matter how good a ballast and rail were used, the track would be rough and puddly by the mud working up through ballast in wet track.

(b) In the fall the section men should go over their sections, clean out all ditches and bridges, and level dirt down to subgrade.

(c) Ditches to drain the ballast are better than none at all, but they will not aid materially in maintaining good surface. All ditches should be deep enough to properly drain the subgrade. The bottom of the ditch should be from two to three feet below the bottom of the tie, depending on the nature of the soil. Such a ditch, if properly constructed, will keep the roadbed fairly well drained and aid materially in maintaining the surface; and, in addition, will reduce to a considerable extent the liability of track heaving during the winter months.

(d) Particular attention should be paid to drainage at frogs, switches, railroad crossings, and street and highway crossings. The remedy depends on the local conditions. This depends, in turn, on the matter of providing sufficient rapid drainage, and supplementing it by subdrainage wherever necessary. Blind drains of cobble stone, broken stone, or tile, laid parallel to the track four inches outside of the tie and six inches lower than the bottom of the tie, will carry off the surplus water, avoid the puddling of the joints in crossing and save considerable work and money.

FENCES.

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(b) Right of way fences should be built substantially, posts set firmly in the ground and in good line. Corner posts should be well braced and anchored so that fences will not sag. It is needless to say what kind of a fence is most economical as each state prescribes the kind of fence that will turn stock, and fences built should comply with the requirements of the state law.

(c) Light, convenient gates should be provided at private crossings, and the hearty co-operation of the farmer and land owner should be solicited in keeping these gates closed when not in use. It is economy for each supervisor or roadmaster to have a fence gang of five or six men and foreman, to repair or rebuild fence out of place. In this manner a uniform fence is secured much cheaper than if built by section gangs.

BRIDGES.

7. Section foremen passing over bridges and culverts should note their condition and see that they are safe. Weeds should be cut from around all wooden and pile bridges, and taken from under the bridges to avoid catching fire. All bird's nests in pile trestles or wooden bridges should be removed by the track walker as he passes over the track each day, to prevent the bridges from catching fire from cinders dropping from the engines.

Water barrels at bridges should be filled at intervals; and, in dry weather, where there are long trestle bridges, the local freight trains should be stopped to fill the water barrels.

The Track Walker.

The track walker should be the best and most intelligent man in a section gang. He should be able to read and write the English language and should study the rules of track work and flagging, so that in case he finds a broken rail he would know how to flag trains until he could send word to his foreman to come and replace it.

The track walker's duties are numerous. In passing over the section he should examine and open every locked switch, switch stand and guard rail each day and know that they are positively safe for the day; he should tighten any loose bolts found; drive down any loose spikes to the rail; change any broken angle bars found; reset, if possible, any planks found heaved up in road crossings which are liable to catch the pilots of engines; watch fences and farm gates as he passes over the track, patch any broken fence wires and close farm gates which are left open. The track walker should keep a very close watch for track spreading and spike it back to gage. If it continues to spread he should call the foreman's attention to it.

Cleaning Around Yards, Freight Houses and Station Grounds.

9. (a) In cleaning freight yards at terminals the dirt and scrap that are scattered between the tracks should be gathered up in piles on three or four tracks so there will be no delay to work train waiting on the dirt to be gathered up to load. A work train with twelve or fourteen flat cars should then be furnished to load up this dirt the same day it is put in piles to avoid injury to train or switching crews. To handle this material with a wheel-barrow or box is too expensive and dangerous for men working between tracks where cars are being switched.

(b) In cleaning around freight houses a side dump car should be set at all freight houses and litter and dirt cleaned from the cars should be wheeled to and thrown in the side dump car by the freight house employes and not thrown out on the ground. A wagon with two wheels that will hold a half yard of dirt should be furnished to freight houses and in that way no rubbish or dirt is allowed to accumulate at freight house tracks. This committee has investigated two railroads where this method is employed and freight house tracks are only cleaned once a year by the section men. The cleats torn off doors of freight cars are picked up after cars are open, the good ones saved, the broken ones taken to a salamander and burned by the freight house employee who cleans the cars.

(c) Driveways at freight houses and stations where they are not over one thousand feet long should be cleaned by using a wheel-barrow and having a car to wheel it on. Where drives are longer a horse with a dump cart should be used to pick up dirt and take it to car to load. All old paper and litter around station grounds should be picked up and burned at least twice a week to give the station grounds a tidy appearance.

SIGN POSTS.

10. All sign posts, mile posts, crossing and whistling posts, in fact every sign post of every description should be watched closely, kept set up plumb and weeds and grass kept cleaned from around them to give them a tidy appearance as signs are noticed more by officials when not kept in this condition. Section men should report whenever lettering is noticed to be dim.

DISCUSSION.

There was quite a lot of discussion concerning the amount of work the committee had placed upon the track walker, but the report was adopted as shown in the text.

It was decided to hold the next convention the second week in September, Tuesday the 14th, 1915, in Chicago.

The Greenville & Southeastern has asked for incorporation in South Dakota to build a 10-mile line from Roslyn, S. D.

The Montana Eastern, which started work some time ago on a line from New Rockford, N. D., west to Lewistown, Mont., has track laid from Fairview, Mont., east to Arnegard, 30.4 miles. This road is a subsidiary of the Great Northern.

The Jefferson & Northwestern will make a change of line at Rocky Point, about seven miles out of Jefferson, Tex. There will be about 15,000 cubic yards excavation, 12,000 cubic yards embankment and four acres of clearing.

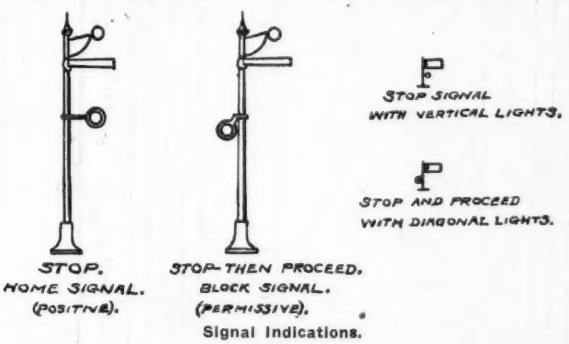
The Signal Department

Single Track Automatic Block Signals Between Sioux City and Missouri Valley, Chicago & North Western

In January and February of this year the Chicago & Northwestern placed in service a single track automatic block signal system between Sioux City and Missouri Valley, Iowa. This installation comprises 150 signals and 74.7 miles. In conjunction with other single track installations, particularly the one between Fond du Lac and Duck Creek, this places the Northwestern within the front rank of single track automatic block signaling, where this company has long been with double track signaling.

A heavy freight traffic to Omaha, Sioux City and St. Paul passes through this territory, there being 32 scheduled trains daily between California Junction and Missouri Valley, 26 between Sioux City and Sargent's Bluff, and between California Junction and Sargent's Bluff an average of 20 trains per day. The automatic block signal has greatly facilitated this movement and as a result of their experience one of the operating officials has stated that "he preferred single track with automatic block signals to double track without, for the efficient handling of traffic." Between California Junction and Missouri Valley, a distance of 6 miles, these signals are now saving one hour per day delay on four freight trains alone, as compared with the old method of telegraph blocking.

The system is the A. P. B., adapted to the local conditions of the Chicago & Northwestern. The positive stop, or opposing movement, signals are located at the ends of passing sidings and control to the next passing siding. A telephone directly connected to the dispatcher's line is located in a small house at the most convenient location to these positive signals. When the positive signal is in the stop position the train cannot proceed without telephonic orders from the dispatcher. The intermediate signals are stop and proceed signals for following movements, as in double and four track installations. The efficacy of this system of operation, when the signal system has been deranged, in being free from unnecessarily long delays, has already been amply demonstrated. On one occasion a severe electrical storm burned out



Signal Indications.

eighteen relays, but notwithstanding making the stops required, all passenger trains reached terminals on time.

All main line turnouts in this territory, as is standard for the Northwestern in automatic territory, are equipped with derails—whether turnouts are on grade or not—which are attached direct to the switch stand. In addition upper-quadrant semaphore indicators are installed and security switch stands at all main line switches (see detail description and illustrations).

SIGNAL INDICATIONS.

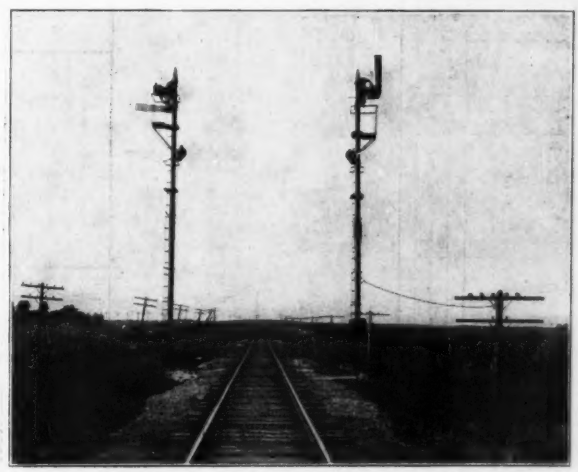
The home signal is a stop-and-stay signal showing a marker casting to the right of the mast for day indication and has vertical lights for night indication. The block signals indicate stop and then proceed, show a marker casting to the left of the signal mast for day, and have diagonal lights for night indication. The color

Stop or Positive Signal, Showing Switch Indicator and Relay Boxes.

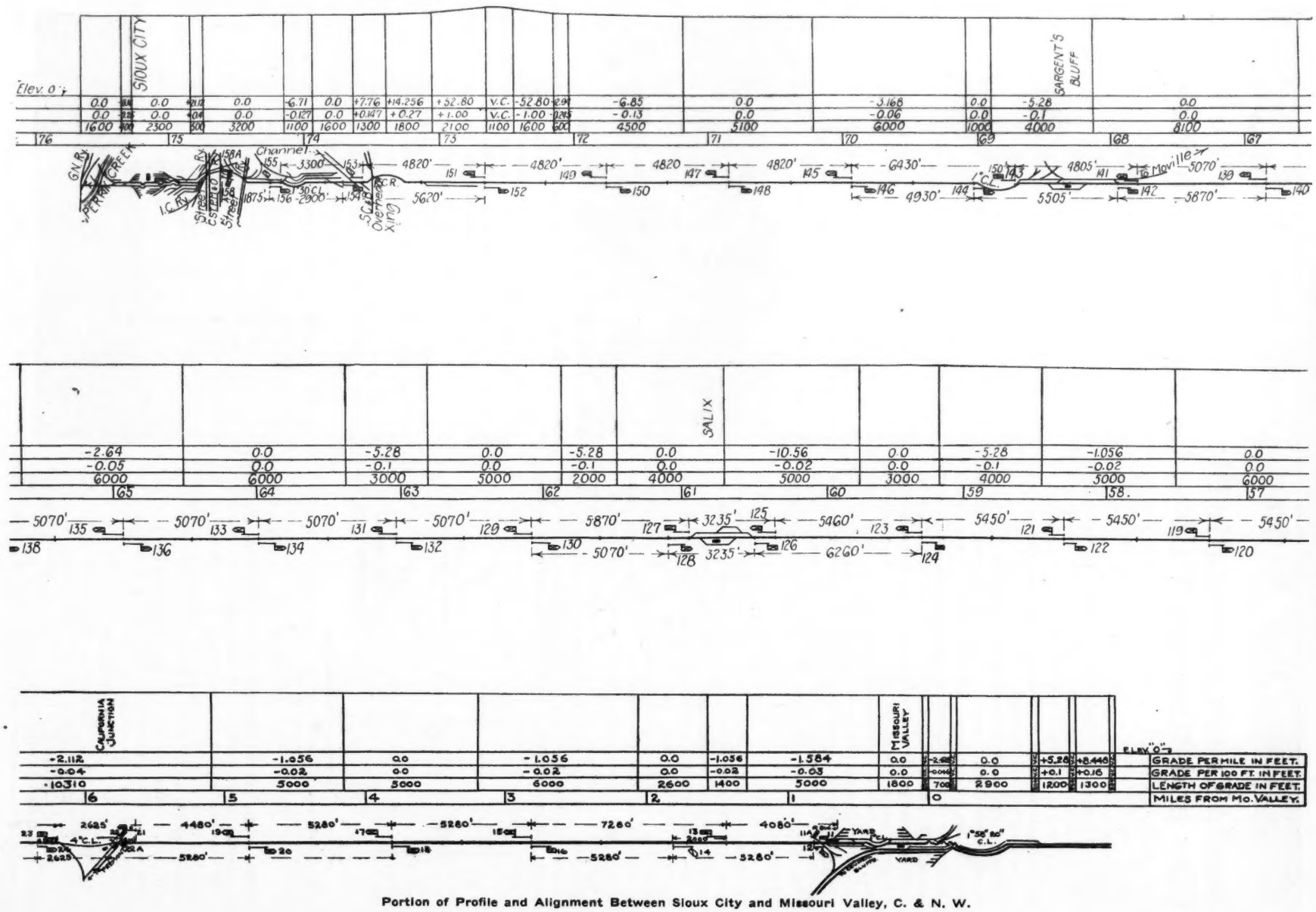
indications are: Green for clear, green and red for caution and red for stop, lunar white being used for marker, the Chicago & Northwestern special double signal lamp being used for the signal proper and single lens lamp for the marker.

LOCATION OF SIGNALS.

The maximum distance between any two signals going south is 7,040 feet, and going north 7,740 feet. This maximum spacing

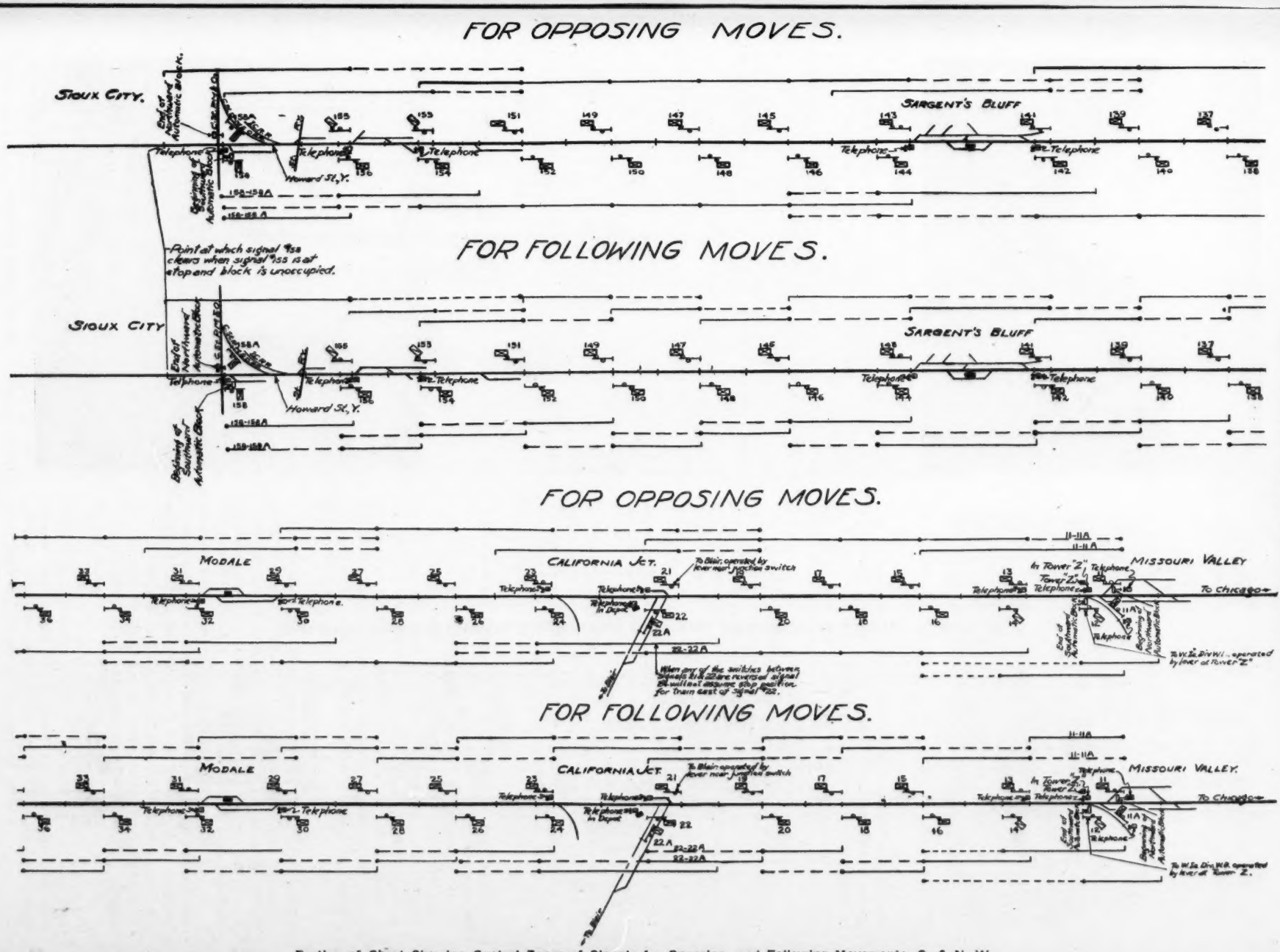


Typical Double Signal Location.

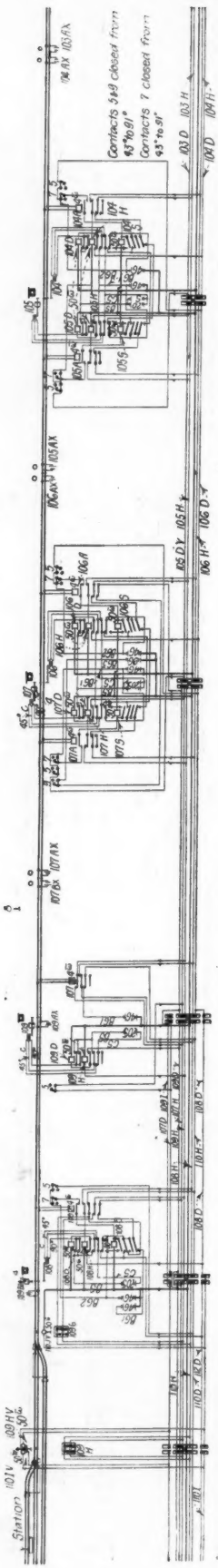


Portion of Profile and Alignment Between Sioux City and Missouri Valley, C. & N. W.

FOR OPPOSING MOVES.



Portion of Chart Showing Control Zones of Signals for Opposing and Following Movements, C. & N. W.



Portion of Standard Circuits, Single Track Automatic Electric Block Signals, C. & N. W.

Train Approaching Intermediate Block.

at these particular points was made necessary by the locations of the passing sidings, and also was advisable on account of the long overlaps used in these sections. In general, the signals are spaced between 4,000 and 5,000 feet apart. The profile and alignment plat shows these locations very plainly.

SIGNALS.

The signals are single-blade, three-position G. R. S. type 2-A signals, with mechanism at top of post. The standard G. R. S.

Double Switch Indicator.

Four Way Relay Box and Post.

control circuit was used in the A. P. block as shown in the illustration herewith.

Signal lamps have long time oil burners.

RELAYS.

The line relays are 60 ohm, and the track relays are 4 ohm, both G. R. S. type, Model 9.

ANNUNCIATORS.

Annunciators are provided at all interlocking plants.

CROSSING BELLS.

There are a number of highway crossing bells, within the signal territory, that are operated in connection with the signal circuits, being controlled by the track circuits adjacent to the crossing.

INDICATORS.

Every switch which is located more than 500 feet from a signal has two switch-indicators. If a switch is within 500 feet of a signal, only one indicator is provided, the signal serving as the other indicator. G. R. S. upper-quadrant semaphore indicators of 56 ohm resistance are used. Indicators do not show "stop" when switches are opened, but only when signals are at "stop" for an approaching train.

LIGHTNING ARRESTERS.

Lightning arresters are B. Z. type No. 3, three-point arresters, manufactured by the Bryant Zinc Company, Chicago. Two points of these arresters attach to the track relay leads and one to the ground.

BATTERIES.

The signal operating batteries consist of five cells of storage battery charged by 13 gravity cells. Gravity battery is used for

Demonstration of Proper Method of Operating Security Switch Stand.

line, a separate signal-control battery being used for each direction with separate batteries for indicators. The track battery consists of 2 cells of battery. The maximum length of track circuits is 3,000 feet. The batteries at signals are housed in concrete battery vaults; 7-foot cast iron chutes are used for track batteries.

INTERLOCKING.

The mechanical interlocking plants were revised to conform with the standard practice. The signals were made upper-quadrant and electrically operated. Signals leading to non-automatic territory are mechanical signals, operating from 0 to 90 degrees in the upper quadrant.

CUT OUTS.

Street car crossings are cut out to prevent stray currents interfering with track relay operation. Track battery is provided immediately on each side of such crossings.

WIRING.

A new pole line was provided for signal circuits and No. 14 copper-clad wire used. Bootlegs are No. 9 copper, as are also leads from track, wire in chutes and all motor wires. Leads from line are No. 14 copper. Common return is broken at every double signal location.

SWITCH STANDS.

All stands are the Security Switch Stand type, which is standard with the Northwestern. These stands have a goose neck lock rod (now being changed to a straight rod) which engages with a crank controlled by a shaft connected direct with the switch stand handle bar. This crank locks the point, through the slots of lock rod, in both the normal and reverse position, when the lever is dropped into the slot in stand proper, after the full movement of the point. The operation of lifting the handle bar out of the slot unlocks the switch point and sets the signals in stop position, before the point moves.

MATERIAL.

The material for construction was stored at convenient central points and was distributed by work train as demanded.

Concrete battery wells were placed and the signal masts erected by a work train with derrick. A concrete mixer was placed on a flat car and the forms for signal foundations were filled therefrom, the forms being placed at the beginning of the work.

The system was designed and installed and the operating rules established under the direction of J. A. Peabody, signal engineer of the Chicago & Northwestern. The actual field work was under the direction of E. C. Carroll, superintendent of construction. We are indebted to Mr. Peabody for the information contained in this article.

California yew which grows on the national forests of that state is finding some use in present-day archery practice. Its qualities closely resemble those of the old-world yew which made the English long-bow famous in mediaeval times.

The Railway Signal Association Convention.

The annual convention of the Railway Signal Association was held at Bluff Point, N. Y., on Lake Champlain, September 22nd to 24th, inclusive. There were 426 registered as attending, 249 of them being members of the association, 177 ladies and 19 men who were invited guests.

Pursuant with the policy of the past three or four years, there were no exhibits of appliances, or materials, for signaling. The exhibits being shown for the Railway Signal Association in conjunction with the exhibits for the annual meeting of the American Railroad Engineering Association, which is held in Chicago in March of each year.

The committees and the special committees handed in reports that were most complete in detail of investigation, cuts and plans shown. The association is now in better condition as to financial standing and numerical list of members than it has ever been. It has grown in membership from a scant three dozen in 1896 to over 2,100 at present, which is a remarkable growth. It was decided to hold the next annual meeting at Salt Lake City in September, 1915.

COMMITTEE REPORTS.

Committee I—Signaling Practice.

Personnel:—

T. S. Stevens, *chairman, A. T. & S. F.*
C. C. Anthony, *vice-chairman, P. R. R.*

H. S. Balliet, *N. Y. C. & H. R. R.*
C. A. Christofferson, *N. P.*
C. E. Denney, *U. S. & S. Co.*
C. A. Dunham, *Gt. N.*
W. J. Eck, *Sou. Ry.*
W. H. Elliott, *N. Y. C. & H. R. R. R.*
G. E. Ellis, *K. C. T. Co.*
A. S. Ingalls, *L. S. & M. S.*
J. C. Mock, *M. C.*
F. P. Patenall, *B. & O.*
J. A. Peabody, *C. & N. W.*
A. H. Rudd, *P. R. R.*
W. B. Scott, *G. H. & S. A.*

Reports on Aspect for Instructions to trains to take siding at a non-interlocked switch; Requisites for Switch Indicators and Automatic Train Control. Also additional data on Track Circuits and Treated Ties.

The association voted to submit "Requisites for Switch Indicators and Automatic Train Control" to a letter ballot. The "Data on Track Circuits and Treated Ties" was accepted as information.

Committee II—Mechanical Interlocking.

Personnel:—

C. J. Kelloway, *chairman, A. C. L.*
D. M. Case, *vice-chairman, C. N. O. & T. P.*

Larsen Brown, *A. T. & S. F.*
G. W. Chappell, *N. Y. N. H. & H.*
W. H. Fenley, *Panama R. R.*
C. S. Foster, *P. B. & W.*
Oswald Frantzen, *N. Y. N. H. & H.*
T. E. Kirkpatrick, *L. S. & M. S.*
J. W. McClelland, *P. & R.*
E. E. Mack, *C. & E. I.*
Samuel Miskelly, *C. R. I. & P.*
W. B. Morrison, *D. L. & W.*
W. M. Post, *P. R. R.*
Chas. Stephens, *C. & O.*
J. I. Vernon, *N. Y. N. H. & H.*
W. F. Zane, *C. B. & Q.*

Mechanical Derail Layouts and Switches. (Eight drawings.)

The association accepted this as a progress report.

Committee III—Power Interlocking.

Personnel:—

F. B. Wiegand, *chairman, L. E. & W.*
R. C. Johnson, *vice-chairman, Wabash.*

A. B. DuBray, *Mo. St. Com.*
C. M. Duffy, *C. R. I. & P.*
G. B. Gray, *Penn. Lines.*
W. H. Harland, *N. Y. O. & W.*
H. H. Harman, *B. & L. E.*
E. C. Hitchcock, *N. Y. N. H. & H.*
L. E. Kinch, *P. R. R.*
J. S. Longworth, *C. R. R. N. J.*
H. C. Lorenzen, *N. Y. C.*
W. N. Manuel, *G. R. & I.*
H. H. Orr, *C. & E. I.*
F. W. Pfleging, *U. P.*
A. P. Pollock, *P. R. R.*
I. S. Raymer, *P. & L. E.*
G. R. Scattergood, *P. R. R.*
T. C. Seifert, *C. B. & Q.*
F. G. Smith, *C. & E. I.*
L. E. Spray, *K. C. T.*
O. R. Unger, *Mo. P.*
C. G. McCaulley, *W. T.*
J. W. McCormack, *K. C. T.*
L. P. Mase, *N. Y. C.*
G. C. Whitney, *N. Y. C.*
G. A. Ziehlke, *U. P.*

Specifications for the Installation of a Vitrified Clay Conduit System, including drawings; Specifications for Incandescent Electric Lamps; The Use of Thirty Volts or Less for the Control of Interlocking Apparatus, Conclusions 1 to 8, inclusive. Revised drawing 1309. All approved for submission to letter ballot.

The association approved the entire report for submission to letter ballot.

Committee IV—Automatic Block.

Personnel:—

W. M. Vandersluis, *chairman, I. C.*
A. R. Fugina, *vice-chairman, L. & N.*

E. L. Adams, *Int. Comm. Comm.*
E. E. Bradley, *W. M. Ry.*
G. H. Dryden, *B. & O.*
E. Folley, *C. & E. I.*
R. E. Greene, *M. C. R. R.*
W. R. Hastings, *C. R. I. & P.*
W. H. Higgins, *C. R. R. of N. J.*
B. A. Lundy, *N. Y. C.*
R. M. Phinney, *C. & N. W.*
E. K. Post, *C. & N. W.*
D. W. Rossell, *N. Y. C. & H. R.*
A. H. Rice, *D. & H.*
D. S. Rice, *L. V. R. R.*
C. F. Stoltz, *C. C. C. & St. L.*
G. W. Trout, *P. M. R. R.*
W. B. Weatherbee, *D. L. & W.*
F. E. Whitcomb, *B. & A.*

Specifications for R. S. A. Cell, Caustic Soda Primary Battery, and Specifications for Direct Current Vibrating Highway Crossing Alarm.

Three (3) drawings showing circuits for Automatic Block Systems submitted as information.

The association approved for submission to letter ballot the entire report of the committee on specifications and circuits for Automatic Block Systems.

Committee V—Manual Block.

Rules Governing Signal Supervisors and Rules Governing Maintenance of Block Signals.

Personnel:—

G. S. Pflasterre, *chairman, N. C. & St. L.*
L. R. Mann, *vice-chairman, Mo. Pac.*

E. T. Ambach, *C. H. & D.*
Hadley Baldwin, *C. C. C. & St. L.*
J. Beaumont, *Int. Comm. Comn.*
M. W. Bennett, *N. Y. C. & H. R.*
E. A. Black, *L. S. & M. S.*
B. O. Darrow, *Sou. Pac.*
Caleb Drake, *C. & N. W.*
M. J. Fox, *C. B. & Q.*
H. K. Lowry, *C. R. I. & P.*
W. N. Spangler, *P. R. R.*
T. S. Stevens, *A. T. & S. F.*

The association voted to approve the recommendations of the committee and to submit them to letter ballot.

Committee VI—Standard Designs, Signal Symbols and Nomenclature.

Personnel:—

J. C. Mock, *chairman, M. C. R. R.*
C. C. Anthony, *vice-chairman, P. R. R.*

G. E. Ellis, *K. C. T. Ry.*
W. A. Hanert, *N. Y. C.*
C. J. Kelloway, *A. C. L.*
F. P. Patenoll, *B. & O.*
F. W. Pfleging, *U. P.*
M. E. Smith, *D. L. & W.*
R. E. Trout, *St. L. & S. F.*

Presenting twenty (20) drawings of various apparatus shown in detail and assembly. Also six (6) exhibits as information.

Report on Signal Symbols and Nomenclature.

This report was approved by the association in toto, to be submitted to letter ballot.

Committee VII—Subjects and Definitions.

Personnel:—

E. G. Stradling, *chairman, C. I. & L.*
R. H. White.
C. G. Stecher, *C. & N. W.*
P. M. Gault, *Ill. Cent.*

Definitions for twelve (12) words.

The work of this committee was to:—

(a) Prepare definitions for technical terms connected with sig

naling, particularly any terms which discussions show are not properly defined.

(b) Compile definitions in the form of a Signal Dictionary, giving terms and definitions only, without descriptive matter.

Although the committee submitted a full report in the definition of the 12 words, the association decided not to take action at present.

Committee VIII—Electric Railways and A. C. Signaling.

Personnel:—

C. H. Morrison, *chairman, N. Y. N. H. & H.*
H. S. Balliet, *vice-chairman, Gr. Cent. Tenn.*

B. T. Anderson, *D. L. & W.*	J. D. Elder, *Det. Riv. Tun.*
W. P. Allen, *P. R. R.*	W. F. Follett, *N. Y. N. H. & H.*
J. A. Beoddy, *N. & W.*	E. C. Grant, *U. P.*
L. R. Byram, *B. R. & P. Ry.*	J. B. Lamb, *Sou. Ry.*
W. W. Morrison, *Gr. Cent. Ter.*	E. B. Smith, *Gr. Cent. Term.*
H. G. Morgan, *Ill. Cent.*	F. S. Starratt, *Sou. Pac.*
C. R. Peddle, *Int. Rap. Trans.*	F. E. Wass, *Gr. Cent. Term.*
W. Y. Scott, *B. & M.*	G. H. Wion, *P. T. & T.*

Specifications for Transformer Oil; Specifications for Petrolatum for Use in Impedance Bonds; Specifications for A. C. Electric Generators, and Specifications for Overhead Crossings of Electric Light and Power Lines. Also Data of Systems, using A. C. in Railway Signaling submitted as information.

The association accepted the report of the committee on the various specifications and voted to submit them to letter ballot for final adoption.

The data for A. C. systems was accepted as information.

Committee IX—Wires and Cables.

Personnel:—

W. H. Elliott, *chairman, N. Y. C. & H. R.*
E. L. Adams, *vice-chairman, Int. Com. Comm.*

W. I. Bell, *P. R. R.*	D. W. Richards, Jr., *N. & W.*
W. L. Dryden, *S. I. Rap. Trans.*	J. V. Young, *B. & M.*

Changes in existing Specifications for Galvanized Steel Signal Wire.

Specifications for Galvanized Messenger Wire, also Recommended Sags for Messenger Wire of various sizes and strength; Specifications for Rubber Insulated Tape and Specifications for Friction Tape.

The association approved of changes in existing specifications for steel wire and voted to submit them to letter ballot.

Committee X—Storage Battery and Charging Equipment.

Personnel:—

R. B. Elsworth, *chairman, N. Y. C. & H. R.*
G. E. Beck, *vice-chairman, L. S. & M. S.*

J. G. Bartell, *L. V. R. R.*	A. H. McKeen, *O. W. R. R. & N.*
T. N. Charles, *C. N. O. & T. P.*	T. J. O'Meara, *N. Y. C. & H. R.*
E. G. Hawkins, *N. Y. C. & H. R.*	John Parker, *N. Y. C. & H. R.*
A. B. Himes, *B. & O.*	F. A. Purdy, *Or. Short Line.*
J. Fred Jacobs, *C. R. R. of N. J.*	A. H. Yocum, *P. & R.*
T. L. Johnson, *D. L. & W.*	

Specifications for Electrolyte for Lead Type Storage Battery; Specifications for Nickel, Iron Alkaline Storage Battery and Specifications for Concrete Storage Battery Box. Also eight (8) drawings.

The association voted to approve the report of the committee for submission to letter ballot.

Special Committee—Method of Recording Signal Performance.

Personnel:—

W. N. Manuel, *chairman, G. R. & I.*
L. L. Whitcomb, *vice-chairman, L. S. & M. S.*

C. A. Cotton, *A. T. & S. F.*	G. W. Kydd, *C. H. & D.*
B. F. Dickinson, *W. J. & S.*	Geo. J. Patton, *D. L. & W.*
Paul M. Gault, *Ill. Cent.*	C. O. Warner, *N. Y. N. H. & H.*
S. B. Keller, *B. & O.*	J. B. Weigel, *St. L. & S. F.*

Five (5) forms for recording interruptions to traffic by signals.

The association voted to accept the report of this committee and submit it to letter ballot for final adoption.

Special Committee—Signaling Requirements of Electric Railways.

Personnel:—

J. M. Waldron, *chairman, I. R. T. Co.*
R. C. Johnson, *vice-chairman, B. R. T.*

John Leisenring, *Ill. Tract.* C. H. Morrison, *N. Y. N. H. & H.*

Report showing Signal Aspects and Rules for same as adopted by the American Electric Railway Association submitted as information.

The association voted to accept the report of this committee as information.

Special Committee—Lightning Protection.

Personnel:—

E. G. Hawkins, *chairman, N. Y. C. & H. R.*
J. C. Mill, *vice-chairman, C. M. & St. P.*

G. R. Cowherd, *A. T. & S. F.*	K. A. Hinton, *C. H. & D.*
L. D. Dickinson, *U. P.*	Stanley W. Law, *N. P. Ry.*
Thos. Duffy, *B. & A.*	H. W. Lewis, *L. V.*
C. E. Goings, *P. R. R.*	J. D. Philips, *P. & R.*
G. B. Gray, *Penn. Lines W.*	Edgar Winans, *A. T. & S. F.*

Specifications and Requisites for Air Gap Lightning Arresters; Specifications and Requisites for Vacuum Gap Lightning Arresters and Specifications and Requisites for Choke Coils for use with Lightning Arresters.

The association voted to refer this report back to the committee for further consideration and to be presented at the March meeting.

The election of officers was by letter ballot and the results for the ensuing year were:—President, Thomas S. Stevens, Atchison, Topeka and Santa Fe; vice-president (in the sequence of office), W. J. Eck, Southern Railway; second vice-president, C. A. Dunham, Great Northern; secretary-treasurer, C. C. Rosenberg, Bethlehem, Pa., being the eighth year of Mr. Rosenberg's tenure of this office.

THE TRACK SUPPLY ASSOCIATION AT THE ROADMASTERS' CONVENTION.

The Track Supply Association had a better and more varied exhibit this year than ever. The annual banquet was attended by 400, the music of popular songs and the speeches being thoroughly enjoyed by the assembled guests.

At the annual meeting held on the morning of September 10 the following officers were elected: President, E. M. Fisher, Fairbanks, Morse & Co.; vice-president, F. A. Preston, P. & M. Company; secretary-treasurer, W. C. Kidd, Ramapo Iron Works; director for one year, L. P. Shanahan, American Steel & Wire Company; director for two years, R. A. Van Houten, Sellers Manufacturing Company.

EXHIBITS.

The following companies had exhibits at the convention:

Ajax Rail Anchor Company, Chicago—Double grip rail anchor. Represented by H. C. Elfborg.

American Guard Rail Fastener Company, Philadelphia, Pa.—Vaughan guard rail clamp. Represented by David L. Vaughan.

American Hoist & Derrick Company, St. Paul, Minn.—Transparency and photographs illustrating American railroad ditcher. Represented by Edward Coleman and C. C. Austin.

American Steel & Wire Company, Chicago—Steel fencing, posts and gates. Represented by L. P. Shanahan, C. J. Boon, J. F. Alexander and J. W. Collins.

American Valve & Meter Company, The, Cincinnati, Ohio—Anderson interlocking switch stand and safety switch lock, quick repair and economy switch stands. Represented by F. C. Anderson and J. T. McGarry.

Buda Company, The, Chicago—Motor cars, switch stands, grinders, jacks and drills. Represented by G. J. Slibeck and Emil Johnson.

Carnegie Steel Company, Pittsburgh, Pa.—M-28 insulated and non-insulated steel ties, various sections of Duquesne bars and Braddock insulated rail joints. Represented by Robert Coe.

Commercial Acetylene Railway Light & Signal Company, New York City—Acetylene flashlight signal lighting and acetylene signal lighting. Represented by H. G. Doran.

Creepcheck Company, The, New York City—Dinklage Creepcheck rail anchor. Represented by O. Metcalf, John R. C. Long and M. S. Schmalholz.

Crerar, Adams & Co., Chicago—Calumet track drill, Eureka bonding drill, carbic light, Mac-it set screws, enameled signs, jacks. Represented by Russell Wallace, W. J. Clock, J. A. Martin and G. D. Bassett.

Daniels Safety Device Company, Chicago—Bulldog nut. Represented by C. W. Rhoades and B. E. Dettman.

Duff Manufacturing Company, The, Pittsburgh, Pa.—Jacks. Represented by C. W. Thulin and G. A. Edgin.

Fairbanks, Morse & Co., Chicago—Kerosene and gasoline motor cars. Represented by E. M. Fisher, L. H. Matthews, E. C. Golladay, F. M. Condit and A. A. Taylor.

Fairmont Machine Company, Fairmont, Minn.—Fairmont engines. Represented by F. E. Wade and H. E. Wade.

Frictionless Rail, Boston, Mass.—Frictionless rail. Represented by T. F. Dwyer, Jr., and Geo. H. Bryant.

Gosso Company, The, Chicago—The Gosso bed. Represented by A. E. Gosso and T. J. Burke.

Hatfield Rail Joint Company, New York City—Hatfield rail joint. Represented by C. P. Williams.

Lackawanna Steel Company, Buffalo, N. Y.—Lackawanna hook shoulder tie plate, Abbott rail joint plate, spikes and bolts. Represented by C. H. Hobbs, F. E. Abbott and A. H. Weston.

Madden Company, The, Chicago—Three-man track layer, Brown rail loader. Represented by T. D. Crowley and H. C. Holloway.

Morden Frog & Crossing Works, Chicago—Guard rail clamps, rail braces, compromise joints. Represented by Arthur C. Smith, W. J. Morton and W. H. Hartz.

Mudge & Co., Chicago—Motor cars. Represented by B. W. Mudge, R. D. Sinclair and George W. Bender.

National Lock Washer Company, The, Chicago—Hi-power nut locks. Represented by John B. Seymour, Jesse Hough and John T. Patterson.

National Malleable Castings Company, The, Cleveland, Ohio—Rail braces, tie plates, wrecking hooks and washers. Represented by J. J. Byers.

Northwestern Motor Company, Eau Claire, Wis.—Casey Jones engines. Represented by R. R. Rosholt and F. W. Anderson.

P. & M. Company, The, Chicago—P. & M. rail anchors. Represented by P. W. Moore, F. A. Preston, A. R. Sutter, W. W. Glosser, S. M. Clancey, George E. Johnson and R. Harris.

Pennsylvania Steel Company, The, Steelton, Pa.—New Century switch stands; steel and positive switch stands, Never-Turn bolts, Mayari shovels. Represented by W. H. Allen and Stanley H. Smith.

Pittsburgh Steel Company, Pittsburgh, Pa.—Wire fencing, nails, staples and barbed wire. Represented by W. Sidney Lewis and H. C. Woodside.

Pocket List of Railroad Officials—Copies of publication. Represented by J. Alexander Brown and Charles L. Dinsmore.

Positive Rail Anchor Company, Louisville, Ky.—Positive rail anchors, Betts anti-creeper tie plate, Economy switch points. Represented by W. M. Mitchell, W. E. Marbel, J. A. Shoulty, John C. Haswell and Charles J. Webb.

Prince-Groff Company, The, New York City—Wedglock track drills, Kwikgrip wrenches, Pressurlokd water gage systems. Represented by Sherman W. Prince and C. B. Groff.

Q & C Company, The, New York City—Vaughan rail anchor, Bonzano rail joint, O'Brien insulated joint, Q & C special guard rail clamp. Represented by J. V. Westcott, E. M. Smith, A. R. Horn and A. E. Stokes.

Rail Joint Company, The, New York City—Weber, Continuous, Walhaupter and 100 per cent rail joints, reinforced angle bars. Represented by E. A. Condit, D. C. Isbester, R. W. Smith, W. C. Boyce, Chas. Jenkinson, C. B. Griffin, G. T. Willard and G. H. Larson.

Railroad Supply Company, The, Chicago—Tie plates and derailers. Represented by A. H. Smith and H. G. Van Nostrand.

Railway Age Gazette—Copies of publication. Represented by E. T. Howson, H. H. Simmons, K. L. Van Auken and Walter M. Ford.

Railway List Company—Copies of publication. Represented by William E. Magraw, W. A. D. Short and Dalton Risley.

Ramapo Iron Works, Hillburn, N. Y.—Solid rolled double shouldered switch slide plate, manganese switch points, automatic switch stands. Represented by W. C. Kidd, Thos. E. Akers, A. Germunder, Denby Germunder and E. P. Bigelow.

Reading Specialities Company, Reading, Pa.—Rail straightener, reversible rail bender, guard rail clamps, rail joints, compromise step joint, trolley car rerailer, car deplacers. Represented by B. J. Buell, F. G. Dunbar and George W. Sargent.

Sellers Manufacturing Company, Chicago—Tie plates. Represented by R. A. Van Houten, G. M. Hogan and T. F. Geraghty.

Southern Railway Supply Company, St. Louis, Mo.—Saunders car stopper, Whitman & Barnes tools. Represented by Dick Achuff.

Spencer Otis Company, Chicago—Tiger steel bunks, absolute lock nuts, Economy tie plates. Represented by T. W. Blatchford, H. H. Hart and W. L. Doremer.

Suggitt, J., Minneapolis, Minn.—Reversible side guard plow. Represented by J. Suggitt.

Templeton, Kenly & Co., Ltd., Chicago—Simplex jacks. Represented by A. E. Barron, W. B. Templeton and Arthur Lewis.

Union Switch & Signal Company, Swissvale, Pa.—Keystone insulated rail joints. Represented by J. J. Cozzens.

Verona Tool Works, Pittsburgh, Pa.—Track tools, nut locks, levels, gages and jacks. Represented by H. Fisher, E. Wooding and Howard C. Mull.

Wharton, Wm., Jr., & Co., Inc., Philadelphia, Pa.—O'Brien insulated switch rod, guard rail clamps, switch stands, car placers. Represented by Thos. O'Brien and George R. Lyman.

STRUCTURES.

The Atlantic Coast Line is reported in the market for 400 tons of steel for a bridge near Waycross, Ga.

The Atchison, Topeka & Santa Fe will expend $5,000 for protection wall for pre-cooling plant west of San Bernardino, Cal.

The Railway Commission of Canada has approved the plans of the Canadian Pacific and the Canadian Northern for a proposed subway to be built at Dovercourt road, North Toronto, Ont.

The Chicago, Rock Island & Pacific has agreed to accept the plans submitted for the new Union station at St. Paul, Minn. Work on the new terminal will be started next spring, it is expected.

The Kansas City Terminal Co. will operate trains through the new Union station at Kansas City, Mo., on November 1.

The Louisiana Railway & Navigation Co. has awarded a contract for 215 tons of steel to the American Bridge Co.

The Louisville & Nashville has work under way on the construction of a 12-stall roundhouse and repair shops in the yard at Lexington, Ky.

The Louisville & Nashville has submitted plans for a new viaduct on Commerce Street to the city of Greenville, Ala.

The Southern has given a contract to R. V. LaBarre, Birmingham, Ala., for a new frame passenger station at Hawkinsville, Ga. The present combined passenger station and freight house will be remodeled and used exclusively as a freight house.

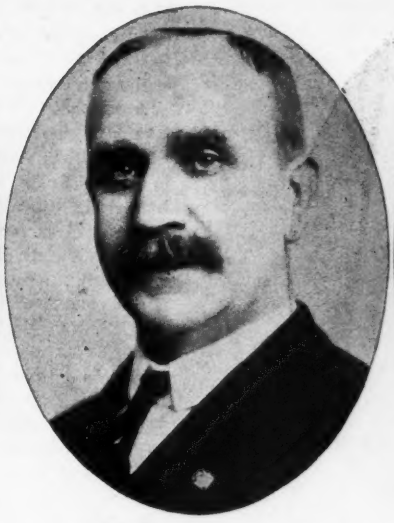
The Minneapolis & St. Louis has awarded a contract for the erection of a passenger station at Albert Lea, Minn., to C. F. Mayer & Co., Humboldt, Ia.

The New Orleans Railway & Light Co. will construct a new station at West End Park, New Orleans, La., to cost about $30,000.

The Pennsylvania has started work on the reconstruction of the bridge over the Ohio river at Brunots island, which it will take two years to complete. About 4,000 tons of steel will be required for the improvement.

The Pennsylvania will construct a 1,000,000,000 gallon reservoir at headwaters of Tipton Run in Blair County, Pa.

COLEMAN KING, L. I. R. R.
1st Vice-President.

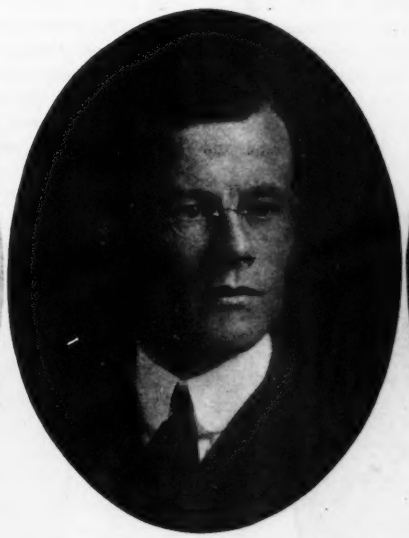


M. BURKE, C. M. & St. P.,
2d Vice-President.

L. C. RYAN, C. & N. W.,
Secretary-Treasurer.

Some of the Officers of the Roadmasters and Maintenance of Way Association for Ensuing Year.

E. M. FISHER, Fairbanks, Morse & Co.,
President.



F. A. PRESTON, P. & M. Company,
Vice-President.

W. C. KIDD, Ramapo Iron Works,
Secretary-Treasurer.

Officers of Track Supply Association for Ensuing Year.

R. A. VAN HOUTEN, Sellers Manufacturing Co., Director for Two Years of the Track Supply Association.

Personals

F. L. Stuart, chief engineer of the Baltimore and Ohio railroad, has been named by Mayor John Purroy Mitchell, of New York, as a member of the advisory committee on port development. It is planned by the New York authorities to work out a comprehensive plan of enlarging the shipping facilities of the city, both of water and rail traffic, and in such connection the co-operation of the railroad companies entering that city is sought. Ralph Peters, president of the Long Island railroad, and P. J. Flynn, vice-president of the Delaware, Lackawanna and Western railroad, will serve on the advisory committee with Mr. Stuart.

W. A. Christian, formerly first assistant to the chief engineer of the Chicago Great Western railroad, has been appointed by the Interstate Commerce Commission as senior civil engineer in charge of the roadway and track department for the Central District of the Division of Valuation, with headquarters at Chicago. Mr. Christian graduated from the University of Cincinnati and his early work was with the Baltimore and Ohio, Chesapeake and Ohio and C. C. C. & St. L. railroads. In 1894 he was assistant county engineer of Hamilton County, Ohio, and from 1895 to 1902 was with the United States Army Engineer Corps as U. S. assistant engineer in charge of plans and estimates for river and harbor improvements. He was then with the Big Four railroad for about a year on maintenance work, and from 1903 to 1907 was again with the U. S. Army Engineer Corps as U. S. assistant engineer in charge of plans and estimates for concrete movable dams in the Ohio river. Since 1907 he has been with the Chicago Great Western railroad as assistant chief engineer. He is a member of the American Society of Civil Engineers and of the American Railway Engineering Association, being chairman of the Committee of Records and Accounts.

W. E. Van Hook has been appointed to the position of office engineer for the Central District of the Division of Valuation, Interstate Commerce Commission, with headquarters at Chicago. He is a graduate civil engineer of the University of Wisconsin. The first five years after graduation he was on railroad work in location, construction, maintenance and valuation work with the Chicago and North Western railway, Chicago and Alton railroad, and the Chicago, Milwaukee and Puget Sound railroad. For the past three years he has been with the Illinois Railroad and Warehouse Commission and later the Public Utilities Commission of the state of Illinois. He is a member of the Signal Association.

D. K. Van Ingen has been appointed second assistant field engineer in the Central District of the Division of Valuation, Interstate Commerce Commission, with headquarters at Chicago. He was educated at Rensselaer Polytechnic Institute, and has been with the Chicago and North Western railway, Choctaw, Oklahoma and Gulf railroad and New York Central and Hudson River railroad, having been assistant engineer in charge of valuation work on yards and terminals in Iowa on the Chicago and North Western since 1913 and within the last month having been appointed as chief draftsman in the valuation department of the same road. Mr. Van Ingen is a member of the Western Society of Engineers.

J. A. Lindstrand has been appointed senior architect in the Central District of the Division of Valuation, Interstate Commerce Commission, with headquarters at Chicago. Mr. Lindstrand was for fifteen years in the architect's office of the Chicago, Burlington and Quincy railroad and for the past eight years has been architect for the Chicago, Milwaukee and St. Paul railway.

H. E. Kellenberger has been appointed senior signal engineer of the Central District of the Division of Valuation, Interstate Commerce Commission, with headquarters at Chicago. He was formerly supervisor of signals on the Chicago and North Western at Boone, Iowa.

Bruce Wyman, who has recently been in charge, as consulting

F. L. STUART, Chief Engineer, Erie R. R. Co.

J. A. LINDSTRAND, Senior Architect, Interstate Commerce Commission.

counsel of the New Haven, of cases affecting the rate structures before the Interstate Commerce Commission, has opened office at 50 Congress street, Boston, and henceforth will specialize in handling railway cases before commissions and courts.

Frank M. Patterson has been appointed field engineer in the Central District, Division of Valuation, Interstate Commerce Commission, with headquarters at Chicago. Mr. Patterson was educated at the University of Iowa. He has been connected with the Chicago, Burlington and Quincy railroad in various capacities, from 1887 until the present time, having been assistant engineer on construction of the St. Louis terminal; resident engineer in Chicago; resident engineer at Hannibal, Mo.; roadmaster on the Missouri lines; engineer in charge of certain construction on the Chicago and Alton and Burlington joint line from Mexico to Old Monroe, Mo.; assistant to the engineer of the Illinois district, and later engineer of the Missouri district.

George Strasding has been appointed roadmaster of the Pasco division of the Northern Pacific, with headquarters at North Yakima, Wash.

George P. Johnson, general manager of the Chesapeake and Ohio, has resigned to take service with another company.

W. H. Seward has been appointed assistant engineer of the Chicago, Burlington and Quincy, with headquarters at St. Joseph, Mo., succeeding E. H. Peck.

E. H. Peck, assistant engineer of the Chicago, Burlington and Quincy railroad, has been appointed engineer Missouri district, with headquarters at St. Louis, Mo., to succeed F. M. Patterson, resigned, to go with Interstate Commerce Commission.

J. Q. Anderson, roadmaster Atlantic Coast Line at Florence, S. C., has been transferred to Petersburg, Va., in a similar capacity. W. M. Funk, roadmaster at Darlington, S. C., has been transferred to Florence, succeeding Roadmaster Anderson, and B. E. Haley, roadmaster at Kissimmee, Fla., has been transferred to Darlington, succeeding Roadmaster Funk.

A. E. Reid has been appointed supervisor of signals of the Chicago and North Western at Boone, Iowa, succeeding K. E. Kellenberger, resigned.

With The Manufacturers

INSPECTION OF THE EYMON CROSSING.

On Tuesday, September 15, a number of division engineers and roadmasters from Ohio railways visited the Eymon continuous crossing now in service on the main tracks of the Pennsylvania lines at Carrothers, Ohio, for the purpose of inspecting it. This crossing is subjected to the strain of an extremely heavy coal traffic passing over it.

The officials in the party were E. A. Holtzberger, division engineer; B. J. Schwendt, signal engineer; C. Murphy and P. B. Welsh, supervisors, all of the Toledo & Ohio Central.

We are advised that a number of officials of Eastern roads have signified their intention of inspecting this crossing in the near future.

BARTLEY ADJUSTABLE GUARD RAIL BRACE.

Milton Bartley, of the Bartley Automatic Nut & Bolt Fastener Company, Pittsburgh, has recently patented an adjustable guard rail brace and switch point adjustable guard plate.

The feature of the guard rail brace is a heavy tie plate that is placed under the rails from the outer rail of the main track to under the outer rail of the turnout. This plate is cut in two at the center lines of the two tracks and the ends turned up at right angles; the flanges thus formed are bolted together with heavy bolts. These bolts have right and left-hand nuts for the purpose of adjustment and are insulated with fiber sleeves.

The plates have heavy iron braces attached to them, which fit into outside rails to the top of head; these braces are placed in the same manner against the guard rails. A solid metal filler the width of the plate is inserted between the guard rail and tread rail.

The switch point adjustable plate is constructed in the same manner. It is intended that one of these be placed in track one tie to the rear of point of switch and also one tie ahead.

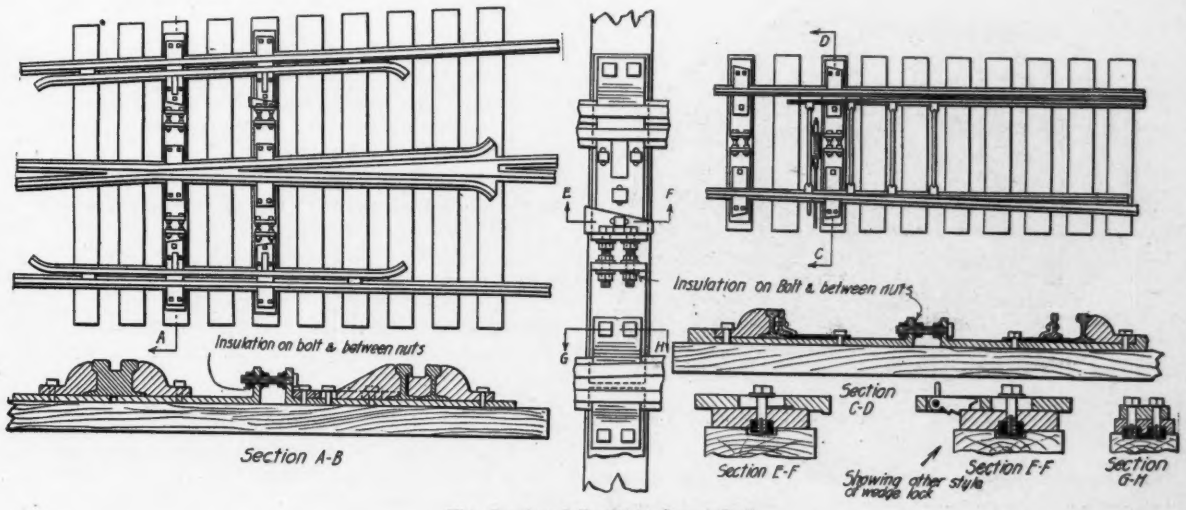
IMPROVED TYPE OF RAILWAY MOTOR CAR.

The new class "FFS" twelve-horsepower section and bridge car, which Mudge & Co. are now building, differs but little from their standard eight-horsepower car, class "FS," and practically all parts are interchangeable.

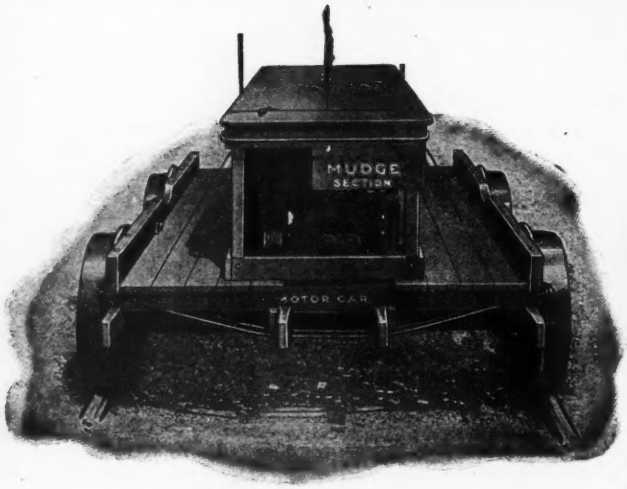
The rear view of the class "FFS" shown herewith shows the sturdy construction, ample seating room and wide carrying space between seat frame and outside safety side rails.

One of the features of this car is the free running engine which cranks from the side, as shown in the accompanying picture. This allows the operator to pick up a trailer and to get under way from a standstill by simply moving forward the lever in the center of the car, which expands the shoes within the positive clutch on the rear axle.

The engine is operated in the reverse by simply shifting the cam

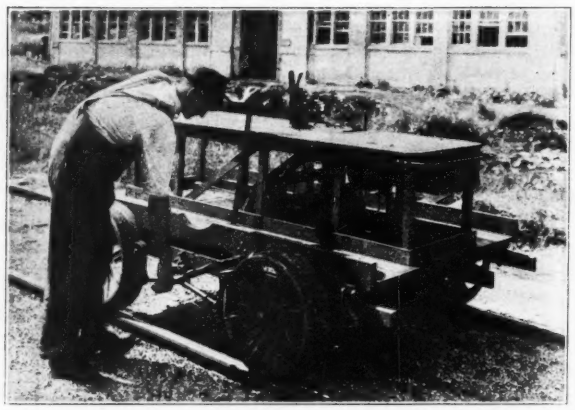


The Bartley Adjustable Guard Rail.



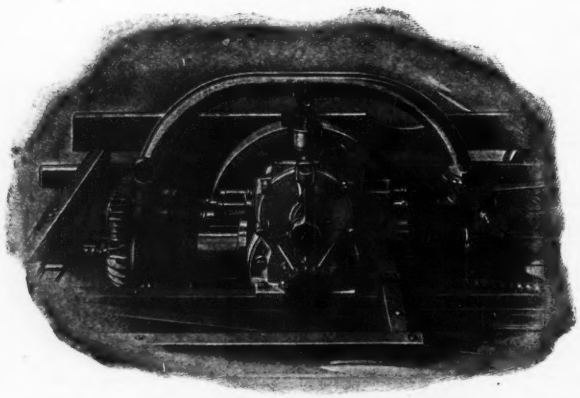
Rear View of Mudge & Co. FFS Motor Car.

lever, which is located conveniently on seat board. It operates equally well in either direction.



Side View, Showing Man Cranking Car on Side, Mudge & Co. FFS Car.

The power plant is the two-cylinder opposed type with 4½" bore and 5¼" stroke of pistons. One flywheel of fan type is used. Power is transmitted to rear axle through roller chain and clutch.



View of Engine, Mudge & Co. FFS Motor Car, Showing Horizontal Cylinder.

For unusually severe requirements where there are stiff grades to negotiate and heavy loads to pull this car seems to be especially adaptable.

Saunders' Car Stoppers Installed in East St. Louis Yards, Southern Railway Supply Co.

The Gun-crete Co., of Chicago, the announcement of whose organization appeared in the May periodicals, has just announced that taking effect September 1, 1914, they have purchased all the rights, titles, contracts and interests of the Cement-Gun Construction Co. and have also taken over the Construction Department of the General Cement-Gun Co.

This enlarges the scope of their business very greatly. In future the combined business will be conducted under the firm name of Cement-Gun Construction Co., with offices at 914 So. Michigan Ave.

The officers of the company are:
Carl Webber, C. E., President.
John V. Schaefer, M. E., Secretary and Treasurer.
C. L. Dewey, Construction Manager.

In addition to doing all forms of cement-gun construction work they will also sell and lease complete cement-gun equipments.

Wellington B. Lee will henceforth handle the Superior rail anchor for the Track Specialties Co., New York, in eastern territory. It is also anounced that the Sargent Co., 1418 Fisher building, Chicago, will rdepresent the Track Specialties Co. in the Chicago district.

Al H. Hoffman, president of the Wimo Supply Co., 304 Oriental building, Seattle, Wash., the representative of the Indianapolis Switch & Frog Co., Springfield, Ohio, in Seattle and vicinity, has also been appointed to cover the territory formerly handled through representatives at Spokane and Portland.

The Monarch Steel Castings Co. of Detroit, Mich., has opened an exhibit in the office of H. F. Wardwell, their Chicago representative, Railway Exchange building, Chicago, of Lion and Monarch couplers, Lion coupler pockets for locomotives, and Lion cast steel yokes.

The general sales offices of the Cambria Steel Co., now located at Johnstown, Pa., are to be removed within a few weeks to Philadelphia. It is expected that not later than November 1 the entire sales offices will be located on the seventeenth floor of the Morris building in Philadelphia.

The new plant of the Universal Portland Cement Co. is rapidly being erected. About eighty per cent of the foundations are in; the machine shop and storeroom are ready for occupancy. The structural frame for raw material bins, coal bins and trestles are complete and the contract work on the cement stock house will commence shortly.

The Jellico Coal & Railroad Co. will receive bids for 20 miles of railroad within 30 days, it is said. D. C. Barker, Jellico, Tenn., is chief engineer.

The Kinston Mfg. Co., Kinston, N. C., proposes to build a railroad from Kinston to Maple Hill, N. C., 35 or 40 miles southward.

The Magno Copper Co. contemplates the construction of about 30 miles of narrow gauge railroad from Superior to Webster, Ariz. W. C. Browning, Superior, Ariz., is manager of the company.